

Kern County Water Agency –
Improvement District No. 4

URBAN WATER MANAGEMENT PLAN

2015 UPDATE

Kern County, CA
June, 2016

Prepared for:
Kern County Water Agency
Bakersfield, CA

Prepared by:
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Abbreviations

AB	State Assembly Bill
af	acre-feet
afy.....	acre-feet per year
bgs.....	below ground surface
BMP	Best Management Practice
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CII	Commercial, Industrial, Institutional, water use sectors
CIMIS.....	California Irrigation Management Information System
CUWCC.....	California Urban Water Conservation Council
CWC.....	California Water Code
DMM	Demand Management Measures
DOF.....	Department of Finance
DWR	Department of Water Resources
eARDWP.....	electronic Annual Reports to the Drinking Water Program (SWRCB)
ft.....	feet
GIS	Geographic Information System
gpcd.....	gallons per capita per day
gpd	gallons per day
IRWM	Integrated Regional Water Management
mgd	million gallons per day
NPDES.....	National Pollutant Discharge Elimination System
psi.....	pounds per square inch
PWS	Public Water System
RWQCB.....	Regional Water Quality Control Board
SB	State Senate Bill
SGMA	Sustainable Groundwater Management Act
SWRCB.....	State Water Resources Control Board
SWRCB.....	State Water Resources Control Board
UWMP	Urban Water Management Plan
UWMPA.....	Urban Water Management Plan Act
WDR	Waste Discharge Requirement
WRR.....	Water Recycling Requirement
WSCP	Water Shortage Contingency Plan

1 Introduction and Overview

1.1 Purpose

This document presents the 2015 Urban Water Management Plan Update (Plan) for Improvement District No. 4 (ID4) of the Kern County Water Agency (Agency). ID4 has agreements to provide a wholesale treated water supply to four contracting water retailers within its service area. This chapter describes the general purposes of the 2015 Plan, discusses Plan implementation, and provides general information about ID4, the retail purveyors, and service area characteristics.

The Plan is a requirement of the Urban Water Management Planning Act (Act) (Division 6, Part 2.6 of the California Water Code (CWC) §10610-10656). An Urban Water Management Plan(UWMP) must be filed every five years and submitted to the Department of Water Resources (DWR). The submittal is required to meet the requirements of the Act, including the most current amendments that have been made. The Act applies to urban water suppliers with 3,000 or more connections being served or supplying more than 3,000 acre-feet (af) of water annually.

UWMPs are required of the state's urban water suppliers in an effort to assist their resource planning and to ensure adequate water supplies are available for future use. A secondary purpose of the UWMP is to provide for a plan or series of plans during water drought situations. This Plan was prepared according to the requirements of the CWC, Act and the 2015 UWMP Guidebook.

1.2 Background

1.2.1 Urban Water Management Planning Act

An UWMP, specified in CWC section 10610 and following sections, is a planning tool designed to guide the actions of water management agencies in California. It provides agency managers and the public with a broad perspective on a number of water supply issues. It is not and was not intended to be a substitute for project-specific planning documents. For example, while CWC section 10631(d) requires the identification of opportunities for exchanges and transfers of water on a short-term or long-term basis, and later sections require the inclusion of those opportunities in a general water service reliability analysis, neither commits a water management agency to pursue a particular water exchange/transfer opportunity, nor do they preclude exploring exchange and transfer opportunities not identified in the UWMP. When specific projects are chosen for implementation, detailed project plans are then developed, an environmental analysis is prepared, and financial and operational plans are detailed.

In short, an UWMP is a management tool providing a framework for action, but not functioning as a detailed project development plan. It is important that the UWMP be viewed as a long-term, general planning document, rather than as a blueprint for supply and demand management. Water management in California is not a matter of certainty, and planning projections often change in

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response to a number of factors. An UWMP is an effort to generally answer a series of planning questions including:

- What are the known and potential sources of supply and what are the reasonable probable yields from them?
- What is the probable demand, given a reasonable set of assumptions about growth and implementation of good water management practices?
- How well do supply and demand figures match up, assuming the various probable supplies will be pursued by the implementing agency?

Using these “framework” questions and resulting answers, the implementing agency is better-equipped to pursue feasible and cost-effective options and opportunities to meet demands.

The CWC requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year planning horizon, in five-year increments. (ID4 is going beyond the requirements of the Act by developing a plan which spans 25 years);
- Identifies and quantifies adequate water supplies, including recycled water, for existing and future demands, in normal, single-dry, and multiple-dry years;
- Implements conservation and efficient use of urban water supplies; and
- Calls for retail water purveyors to progress towards a 20 percent reduction in per capita water use by 2020. (Not applicable to this Plan)

CWC section 10631 states that for any urban water supplier to be eligible for grant or loan funding administered by DWR, the State Water Resources Control Board (SWRCB), or the Bay-Delta Authority (such as Propositions 84 and 1), the supplier must show implementation of water use efficiency Demand Management Measures/Best Management Practices (DMMs/BMPs) listed and described in the Act and the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding, or show the schedule by which the supplier will begin implementing the DMMs/BMPs. Any supplier not implementing the measures based on cost-effectiveness must submit proof showing why the measures are not cost-effective.

A checklist demonstrating compliance of this Plan with CWC requirements is provided in Chapter 10.

Various other amendments have increased requirements for sections on recycled water use, DMMs, and water shortage contingency plans. Recycled water use sections were added to assist in evaluation of alternate water supplies for future use when projects exceed the current water supplies. DMMs must be clearly described including which measures are being implemented and which are scheduled for implementation in the future. Water contingency plans are to be prepared and coordinated with other water suppliers in the area for use during times of drought.

1.2.2 Urban Water Management Planning Act of 1983

As mentioned above, the Act requires all urban water suppliers with 3,000 or more connections being served or supplying more than 3,000 af of water annually to submit a report that informs the public of the suppliers long-term resource planning and existing and future demands. The urban water suppliers are to report, describe, and evaluate the following:

- Water deliveries and uses
- Water supply sources
- Efficient water uses
- Demand management measures
- Water shortage contingency planning

Each of these topics will be discussed in the following sections in detail.

1.2.3 Applicable Changes to the Water Code since 2010 UWMPs

Several changes have been made to applicable CWC sections since the adoption of ID4's 2010 Plan. These changes are addressed in the various sections of this Update. Some of the more significant changes include:

- The **DMMs in AB 2067** now requires water suppliers to provide narratives that describe their water demand management measures and required retailers to describe their management measure if implemented over a five year period, in order to assure they will meet water use targets. Wholesalers are not subject to this requirement.
- The **Submittal Date specified in AB 2067** has been changed and now requires submission to the DWR by July 1, 2016.
- All **Submittals** shall also be electronically submitted.
- All **Standardized Forms** must be included to display all standardized tables and figures.
- **Water Loss as defined in SB 1420** must include a plan to quantify and report distribution system loss.

1.2.4 Previous Urban Water Management Plan

ID4 has previously prepared a 2010 Plan, which was approved and adopted by the Agency Board of Directors on May 25, 2011. Following adoption, the 2010 Plan was submitted to and approved by DWR. A copy of the 2010 Plan resides in the State Library.

This 2015 Plan serves as an update to the 2010 Plan and complies with all new requirements and regulations.

2 Plan Preparation

2.1 Plan Characteristics

Legal Requirements:

CWC 10617 "Urban Water Supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes, either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributed or sells for ultimate resale to customers. This part applies only to water supplied from public water systems.

CWC 10620 (b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

CWC 10621

(a) Each urban water supplier shall update its plan at least once every five years on or before December 31, in years ending in five and zero, except as provided in subdivision (d).

(d) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

Table 2-1

Standard Table 2-3: Agency Identification

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
<input checked="" type="checkbox"/>	Agency is a wholesaler
<input type="checkbox"/>	Agency is a retailer
Fiscal or Calendar Year (select one)	
<input checked="" type="checkbox"/>	UWMP Tables Are in Calendar Years
<input type="checkbox"/>	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF

Table 2-2
Standard Table 2-2: Plan Identification

Table 2-2: Plan Identification		
Select Only One	Type of Plan	Name of RUWMP or Regional Alliance <i>if applicable</i> <i>drop down list</i>
<input checked="" type="checkbox"/>	Individual UWMP	
	<input type="checkbox"/> Water Supplier is also a member of a RUWMP	
	<input type="checkbox"/> Water Supplier is also a member of a Regional Alliance	
<input type="checkbox"/>	Regional Urban Water Management Plan (RUWMP)	

The 2015 Plan is prepared according to the Guidelines for Wholesale water suppliers, as ID4 provides a wholesale treated water supply to four contracting water retailers within its service area. The Plan is prepared on a calendar year basis, through 2015, and all units are in acre-feet (af) .

2.1.1 Public Water Systems

Legal Requirements:

CWC 10644 (a)(2) *The plan, or amendments to the plan, submitted to the department...shall include any standardized forms, tables, or displays specified by the department.*

CWC 10608.52

(a) *The department, in consultation with the board, the California Bay-Delta Authority or its successor agency, the State Department of Public Health, and the Public Utilities Commission, shall develop a single standardized water use reporting form to meet the water use information needs of each agency, including the needs of urban water suppliers that elect to determine and report progress toward achieving targets on a regional basis as provided in subdivision (a) of Section 10608.28.*

(b) *At minimum, the form shall be developed to accommodate information sufficient to assess an urban water supplier's compliance with conservation targets pursuant to Section 10608.24...The form shall accommodate reporting by urban water suppliers on an individual or regional basis as provided in subdivision (a) of Section 10608.28.*

California Health and Safety Code 116275

(h) *"Public Water System" means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year.*

ID4 operates the Henry C. Garnett Water Purification Plant and associated treated water distribution system, but does not operate any retail public water delivery system, and does not manage the retail systems to which it sells water.

The Henry C. Garnett Water Purification Plant provides a wholesale treated water supply to four retail water purveyors. ID4 falls under the UWMP requirement by delivering in excess of 3,000 af of water annually to its customers. Each of ID4's customers subject to UWMP requirements will file an individual retail UWMP.

2.2 Coordination and Outreach

Legal Requirements:

CWC 10620 (d)(2) Each urban water supplier shall coordinate the preparation of its plan with the other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

CWC 10621 (b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

CWC 10642 Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan...

ID4 provides a wholesale treated water supply to four retail water purveyors. These retail water purveyors fall under the UWMP requirement and have contributed information necessary to complete the demand analysis required in this Plan; however, they will complete their own separate UWMPs in accordance with the Guidelines for retail purveyors. ID4 encouraged participation in the Plan by its four retail water customers and other interested stakeholders. Water resource specialists were retained to assist in preparing the details of the Plan. The Agency also assists in coordinating with its member agencies, which includes ID4.

In addition to the four retail water purveyors receiving treated supplies from ID4, there are other retail water purveyors within the ID4 service area. All of these deliver groundwater pumped within their service areas, and those subject to UWMP requirements will prepare UWMPs on their own. Details of each of the providers are provided in Section 3.4 of this report.

Each of the companies and agencies listed in Table 2-4, plus the City of Bakersfield's Community Development Department and the Kern County Planning and Development Department, were sent a notice of ID4's Plan update in March, 2016, more than 60 days in advance of the public hearing held in May, 2016, were sent a copy of the draft Plan and were sent a copy of the Notice of Intent to Adopt the Plan.

Table 2-3
Water Supplier Information Exchange

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)	
<input type="checkbox"/>	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed.
	Provide page number for location of the list.
<input checked="" type="checkbox"/>	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. Complete the table below.
Water Supplier Name <i>(Add additional rows as needed)</i>	
California Water Service Company	
Casa Loma Water Company	
East Niles Community Services District	
North of the River MWD	
Oildale Mutual Water Company	
Vaughn Water Company	
City of Bakersfield	
NOTES:	

3 System Description

3.1 General Description

Legal Requirements:

<i>CWC 10631 Describe the service area of the supplier.</i>

In 1963, before the formation of ID4, the Agency contracted with DWR for an imported State Water Project (SWP) supply for member units within Kern County, which included 77,000 af annually for what became the ID4 service area. ID4 was formed by resolution by the Agency Board on December 21, 1971 to provide a supplemental water supply to the metropolitan Bakersfield area.

Activities leading to the creation of ID4 were initiated by the Agency Board by adoption of Resolution No. 25-70 on December 10, 1970, which outlines the need for such an improvement district. Agency Resolutions Nos. 16-71 and 17-71 were adopted by the Agency Board on December 21, 1971. These resolutions finalized formation activity and established the boundaries of ID4 as they exist today.

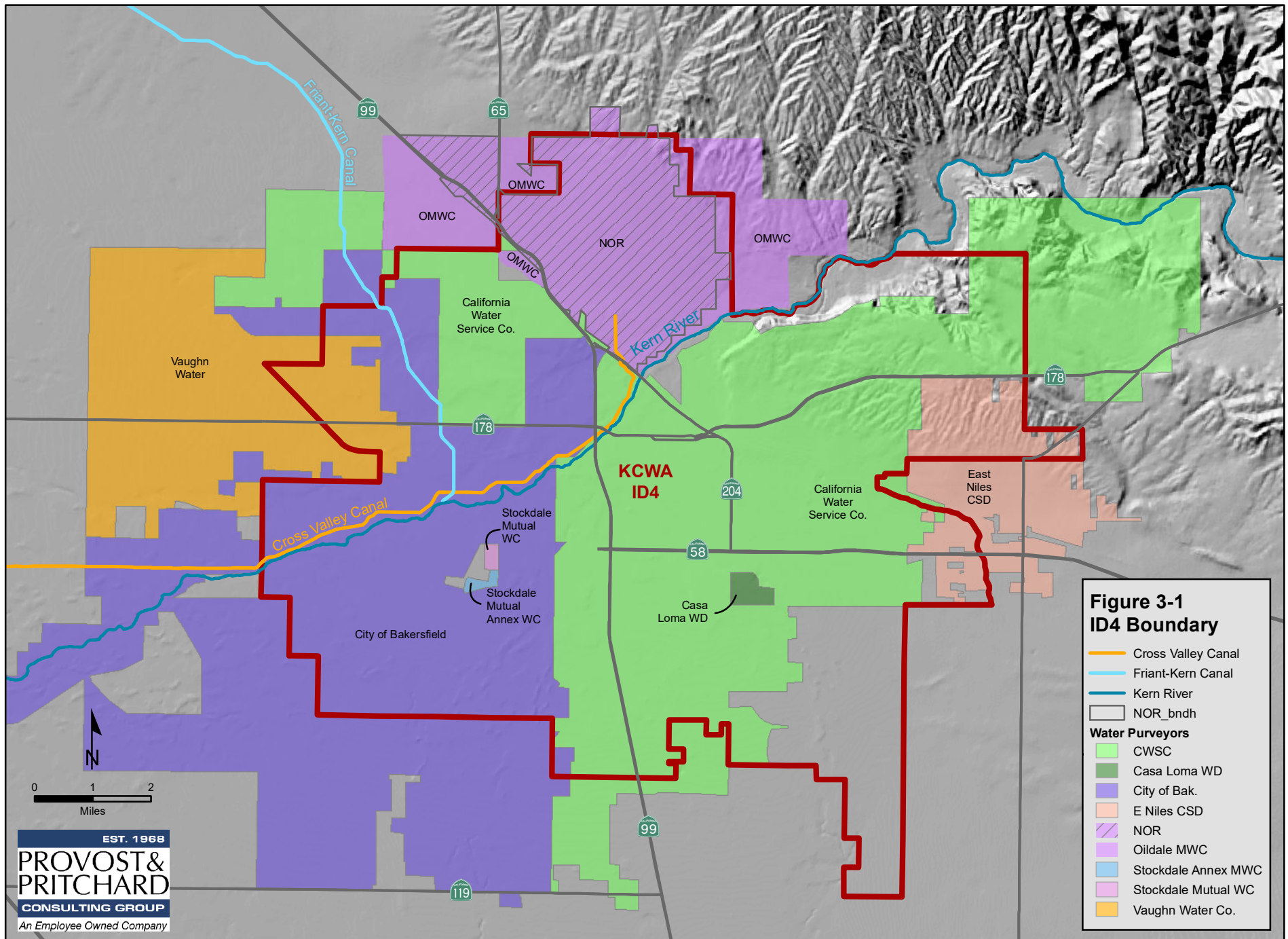
On September 12, 1972, an election was held within ID4, authorizing \$17.5 million of general obligation bonds to construct water purification facilities and ID4's share of the Cross Valley Canal (CVC). ID4 currently has agreements to provide a wholesale treated water supply to four retail water purveyors: the City of Bakersfield's Domestic Water System (COB), California Water Service Company's Bakersfield division (CWSC-BAK), East Niles Community Services District (ENCSD) and North of the River Municipal Water District (NORMWD). NORMWD wholesales treated water to Oildale Mutual Water Company (OMWC). The agencies receiving ID4 treated water are referred to collectively as the "purveyors."

3.2 Service Area Physical Description

ID4 is located in Kern County, in the southern San Joaquin Valley of California. Covering 65,400 acres, ID4 overlies much but not all of the City of Bakersfield's limits, and additionally covers lands outside of the City limits. See Figure 3-1.

The retail water purveyors with service areas completely or partly within the ID4 boundaries are also shown on Figure 3-1.

The boundaries of ID4 have not changed since it was formed and no annexations or detachments are anticipated.



3.3 Service Area Climate

Legal Requirements:

CWC 10631 Describe the service area of the supplier...including climate...

ID4 and the purveyors are located in Kern County, at the southern end of the San Joaquin Valley. The climate in the region is characterized by hot, dry summers and cool, humid winters. The mean maximum daytime temperature ranges from a low of about 57° F in December, to a high of about 98° F in July. Mean overnight low temperatures range from 38° F in December, with occasional overnight frosts, to 70° F in July. Table 3-1 summarizes climate data, including the range in temperatures and precipitation for the year.

Fog is common in the winter and may last for two to three weeks at a time. Precipitation averages just over six inches annually, mostly accumulated between the months of November and April.

3.3.1 Climate Change

Global climate change and the potential impacts it could have on California's future water is a topic of concern for water planners and managers. Climate change models have predicted that potential effects of global warming will result in increased temperature, reduction in Sierra Nevada snowpack depth, early snow melt and a rise in sea level. In the 2013 update of the California Water Plan, multiple scenarios of future climate conditions are evaluated. These changing hydrologic conditions could affect future planning efforts, which are typically based on historic conditions.

Since ID4 is reliant on imported SWP supplies as the primary source of its overall supply mix, any reduction or change in the timing of availability of those supplies could have negative impacts. Reductions in the quantity of SWP water available would force ID4 to rely more heavily on local groundwater and local surface flows, or other sources of imported water. It is possible that local surface flows could also be reduced by changes in snowpack altitude levels and/or quantity of snow pack in the Sierra Nevada and other regional mountain ranges, which would reduce natural recharge, thus exacerbating local groundwater availability problems.

The Global Warming Solutions Act of 2006 (AB 32), committed California to reducing the state's greenhouse gas emissions to 2000 levels by 2010, to 1990 levels by 2020 (approximately 25 percent below what was originally projected), and to 80 percent below 1990 levels by 2050. The California Air Resources Board (CARB) is developing regulations to implement the caps on emissions.

The California Natural Resources Agency has identified numerous climate change adaptation strategies for water management systems. One of the primary strategies is the preparation of Integrated Regional Water Management Plans (IRWMPs). Other adaptation strategies identified by the California Natural Resources Agency include: aggressive water use efficiency in urban and agricultural sectors; use of recycled water; integrated flood management; development of a Central Valley Flood Protection Plan;

local emergency flood preparedness; land use policies to decrease flood risk; establishment of flood plain corridors; and protection of recharge areas.

**Table 3-1
Climate Characteristics**

Month	Standard Monthly Average ETo (inches)	Monthly Average Rainfall (inches)	Monthly Average Temperature(°F)	
			Min.	Max.
January	1.30	1.27	39.2	57.3
February	2.80	1.45	41.6	62.6
March	4.94	0.81	45.6	69.7
April	6.79	0.63	48.8	74.0
May	7.50	0.23	57.0	84.1
June	9.05	0.04	63.5	91.3
July	8.72	0.00	70.0	97.6
August	8.42	0.01	67.5	96.1
September	6.57	0.06	62.7	90.1
October	4.36	0.35	53.4	78.9
November	2.33	0.57	44.9	65.9
December	1.47	0.82	38.3	58.0
Annual Total/Average	4.10	6.24	52.7	77.1
Source: (a) CIMIS Data for ETo Zone 15, 2015 (b) Western Regional Climate Center, Bakersfield Meadows Field Station for the Years 1996 to 2008.				

The 2013 California Water Plan Update identifies numerous probable impacts due to changes in temperature and precipitation. Not all are considered relevant to ID4. For example, sea level change won't directly affect an inland district more than 200 feet above sea level. Other impacts that may become relevant to ID4 include:

- Agricultural land use depends on land conversion and cropping patterns that are driven by the world economy and water availability.
- Conversions of land can lead to changes in water use and water quality.
- Decrease in snowpack, which is a major part of annual storage, due to increasing winter temperatures.
- Warmer temperatures and decreasing temperatures cause more winter runoff and less spring/summer runoff.
- Precipitation changes are difficult to determine, but large precipitation events could be expected with warmer temperatures in some regions.
- Plant evapotranspiration increases with increased temperature.
- Higher water temperatures have a negative effect on some species.
- Storage, transport, and treatment of water involves substantial amounts of energy that could lead to the release of greenhouse gas emissions.
- More extremes in flooding and drought.
- Wildfire in local watersheds can change runoff characteristics and affect water quality.

Even without population changes, water demand could increase, or more likely decrease. Precipitation and temperature influence water demand for outdoor landscaping and irrigated agriculture. Outdoor water use is a large component of purveyor water demands. Lower spring rainfall increases the need to apply irrigation water. Further, warmer temperatures increase crop evapotranspiration, which increases water demand. Recent changes to the state Model Water Efficient Landscape Ordinance (MWELO) in response to the long-term state drought will reduce outdoor water demands particularly with respect to new development.

3.4 Service Area Population and Demographics

Legal Requirements:

CWC 10631 Describe the service area of the supplier, including current and projected population...The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

3.4.1 Land Use

As depicted in Figure 3-2, land use within the ID4 service area is predominantly municipal and industrial (M&I). Following a short-term dry period during 1997-1998, agricultural land use and undeveloped land decreased due to the impacts on crops while M&I simultaneously increased with new developments. Over the past thirteen (13) years agricultural land uses have remained steadily constant despite the more recent dry periods during 2007-2009 and 2012-2015. While land uses remain relatively static,

population within the ID4 service area, and within Kern County since 2010, has shown continuing slow growth.

Table 3-2
Land Use Categories

Land use	Area (acres)	Percent of Total (%)
Developed Municipal and Industrial Uses	55,019	84.1
Agricultural Lands	5,199	8.0
Undeveloped Lands	5,182	7.9
Total	65,400	100.0
Source: ID4 Report on Water Conditions, 2015		

3.4.2 Population

According to the most recent Regional Growth Forecast from Kern COG, the City of Bakersfield's population as of 2014 equals 40 percent of the population for the entire County. The growth forecast in the Kern County 2015-2023 Housing Element Update (January, 2016) projects the County will grow 29.4 percent in population by 2023, or 3.75 percent annually. In contrast, the projected growth rate in ID4 through 2040 is less than 0.70 percent annually. This is because a very large percentage of ID4 is already developed and the opportunities for ongoing growth are not as great as in the metropolitan area as a whole. Additional detail is presented in Section 3.5.

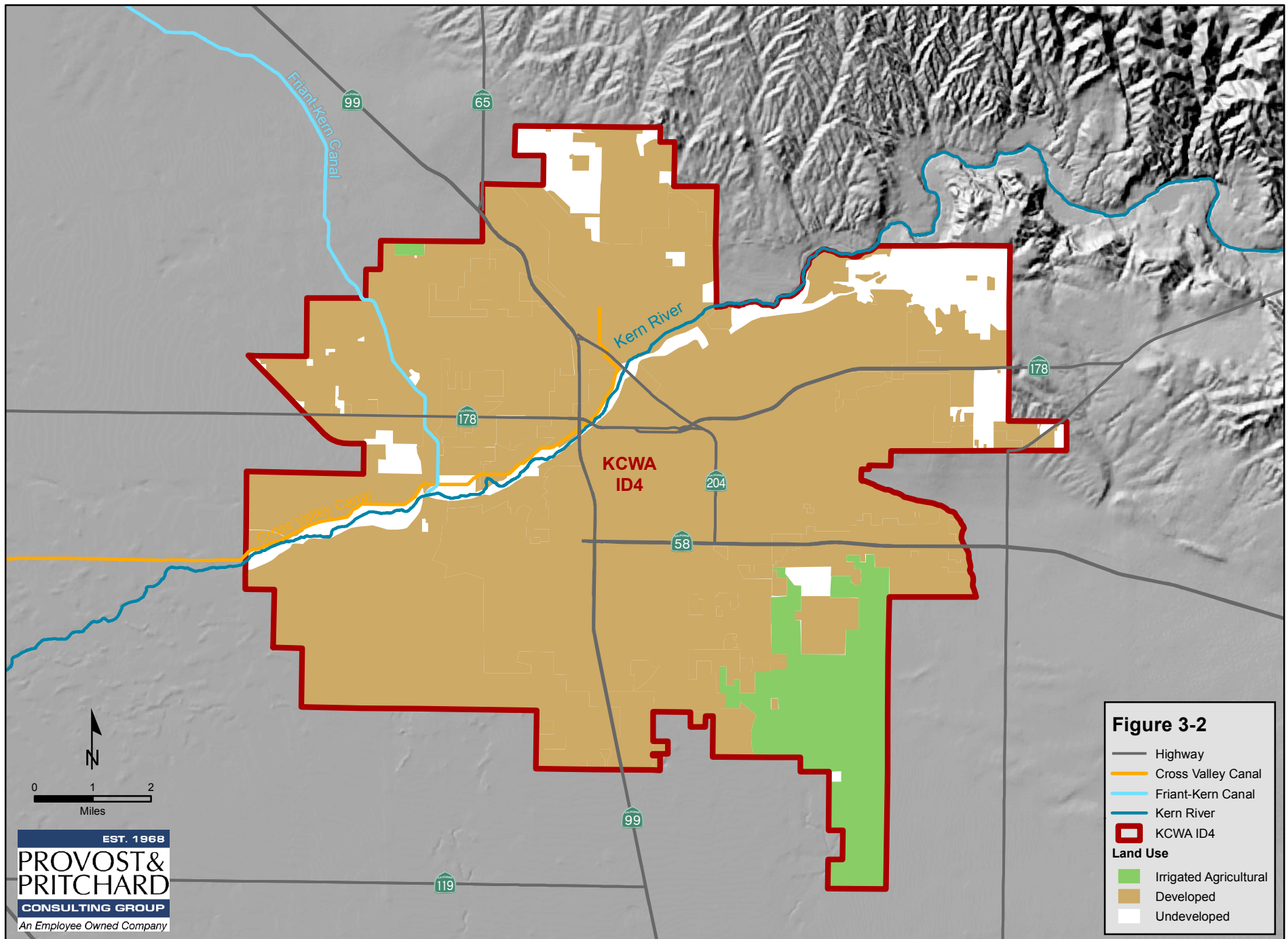


Table 3-3
Standard Table 3-1W: ID4 Population – Current and Projected

Table 3-1 Wholesale: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040(opt)
	386,612	402,551	413,995	425,438	436,882	444,461

Source: Kern COG, 2016

3.4.2.1 Retail Water Purveyors

Each of the retail water agencies purchasing water from ID4 provided current population and estimated future population within their own service areas, which make up the whole of the ID4 service area.

3.4.2.1.1 California Water Service Company

CWSC-BAK serves an area that is fully within the growth boundaries of the City of Bakersfield and is expected to be home to much of the residential growth in the area over the coming years. CWSC-BAK is a division of the largest investor-owned water utility in the western United States and one of the largest in the country. CWSC as a whole serves 1.5 million people in 58 California communities with 21 operating districts stretching from Chico in the north to Palos Verdes in the south.

CWSC-BAK has provided water utility services in the Bakersfield and ID4 areas since 1927. CWSC-BAK encompasses approximately 49 square miles of service area. CWSC-BAK provides water to a population of approximately 247,000 through 70,000 service connections. The predominant land uses with the CWSC-BAK service area are residential and commercial. Single and multiple-family residential services account for 86 percent of all service connections. The CWSC-BAK water supply comes from a combination of local groundwater produced from 82 wells (about 62 percent), surface water from the Kern River (about 18 percent), and water purchased from ID4 (21 percent). All supply purchased from ID4 is delivered as treated water from the Henry C. Garnett Water Purification Plant.

CWSC-BAK has indicated that a South Bakersfield Water Treatment Plant would be built within the next 5-10 years.

3.4.2.1.2 City of Bakersfield

COB serves an area that is highly developed, but still has open residential and commercial lands within it which are expected to build out within the planning horizon of this Plan. The City of Bakersfield is located within the southern San Joaquin Valley in Kern County; approximately 100 miles north of the Los Angeles metropolitan area.

The City of Bakersfield is the principal metropolitan city of Kern County, operating under a council-manager form of government, with the Water Board recommending, administering and implementing domestic water policies set by the City Council. The COB water system is municipally-owned, acquired in 1976, but managed by CWSC-BAK. COB purchased Kern River water rights, land and the physical water distribution systems for what was then known as the Ashe Service Area from Tenneco West. The three

main areas in metropolitan Bakersfield, named River Lakes, Fairhaven and Ashe, now receive water service directly from COB's water system.

COB provides water primarily for residential uses but also for business, commercial, industrial, and public customers in and near the westerly portion of the city limits. COB provides water to a population of approximately 143,148 or 35 percent of the total population, through 44,250 service connections. COB also owns canals and operates the river channels that run through Bakersfield, as well as 2,800 acres of recharge ponds along the Kern River.

For many years, COB had contracted with several local agricultural districts for on-going water supply, which averaged delivery of 70,000 af of Kern River water annually. These contracts all expired in 2011 and COB reports it is in the process of getting these agreements reinstated. Once that is accomplished, annual deliveries will again average 70,000 af.

The majority of the water provided to the agricultural districts is transported through a series of canals throughout the sub-region. These canals play an important role in groundwater replenishment activities by way of percolation (City of Bakersfield, 2015).

3.4.2.1.3 East Niles Community Services District

ENCSD has provided water utility services in the east Bakersfield area since 1955. ENCSD provides water to a population of approximately 31,700 through 7,800 service connections. ENCSD is fully built out, and has been for many years. Minor additional population growth is anticipated within its boundaries, and there are no plans to expand its boundaries.

To meet its customers' needs, ENCSD uses a combination of local groundwater and treated surface water from ID4 and CWSC-BAK (ENCSD, 2015).

3.4.2.1.4 North of the River Municipal Water District and Oildale Mutual Water Company

NORMWD provides treated surface water from ID4 and groundwater to OMWC. NORMWD has a fixed-volume contract with the OMWC, so while the community of Oildale is expected to continue to grow over the planning horizon, the population served by water purchased from NORMWD will remain unchanged.

Previously, NORMWD provided a portion of this water on a wholesale basis to OMWC and also serviced several of its own retail customers. However, on July 1, 2014 all of the retail customers of NORMWD were transferred to OMWC. NORMWD now provides all of the water directly to OMWC, which serves as the retail purveyor for a population of approximately 33,163 people via 10,248 active service connections.

The Oildale service area is adjacent to the Southeast Shafter Service area, which consists of 5,226 acres of agricultural land. OMWC is currently developing residential subdivisions in the Southeast Shafter service area and eventual build out is still being determined by landowners.

3.4.2.2 Other Retail Water Agencies within the ID4 Service Area

Other retail water agencies that lie within the ID4 service area, but are not served treated water by ID4, include Vaughn Mutual Water Company, Casa Loma Water Company, Stockdale Annex Mutual Water Company and Stockdale Mutual Water Company. These retail agencies serve their customers local groundwater.

3.4.3 Other Demographic Factors

Legal Requirements:

<i>CWC 10631 (a) Describe the service area of the supplier, including. . . other demographic factors affecting the supplier's water management planning.</i>
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The ID4 service area is a mature area that is nearing full development, and the purveyors are not planning to increase purchase quantities over time; therefore, limited growth is anticipated. There may be demand changes within currently developed areas depending upon the continued implementation of water conservation strategies adopted by the local agencies and/or mandated by the State of California.

4 System Water Use

This section discusses use of raw and treated potable water within ID4. As a wholesale supplier, ID4 does not manage or distribute recycled water.

4.1 Water Uses by Sector

Legal Requirements:

CWC 10631(e)(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:

- (A) Single-family residential.*
- (B) Multifamily.*
- (C) Commercial.*
- (D) Industrial.*
- (E) Institutional and governmental.*
- (F) Landscape.*
- (G) Sales to other agencies.*
- (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.*
- (I) Agricultural.*

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

This chapter describes historic and current water usage and the methodology used to project future demands within ID4's service area. Water usage is divided into the three sectors relevant to ID4, namely sales to other agencies, groundwater recharge, and losses. ID4 does not use water internally nor does it supply retail customers. More detailed categorization of the water supplied to retail agencies is the domain of those agencies.

Table 4-1
Demands for Potable and Raw Water

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual			
Use Type (Add additional rows as needed)	2015 Actual		
Drop down list <i>May select each use multiple times</i> <i>These are the only use types that will be recognized by the WUE data online submittal tool</i>	Additional Description (as needed)	Level of Treatment When Delivered <i>Drop down list</i>	Volume
Sales to other agencies		Drinking Water	29,032
Groundwater recharge	In-District Transport	Raw Water	14,491
Losses	Out of District	Raw Water	1,972
TOTAL			45,495
NOTES: 7,194 af of available SWP Table A supply carried over to 2016			

ID4 anticipates that it will continue supplying a supplemental water supply to the metropolitan Bakersfield area. The following table reflects anticipated growth by each of the purveyors. ID4 does not foresee changes to ID4 boundaries and does not plan to deliver water to other types of customers in the future.

Table 4-2
Demands for Potable and Raw Water – Projected

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected						
Use Type <i>(Add additional rows as needed)</i>	Additional Description <i>(as needed)</i>	Projected Water Use <i>Report To the Extent that Records are Available</i>				
Drop down list <i>May select each use multiple times</i> <i>These are the only Use Types that will be recognized by the WUEdata online submittal tool.</i>		2020	2025	2030	2035	2040 (opt)
Sales to other agencies	Contracted Sales	49,500	50,500	51,750	53,000	53,000
Groundwater recharge	In-District Transport	9,890	10,075	10,325	10,600	10,600
Losses	Out of District	2,000	2,000	2,000	2,000	2,000
TOTAL		61,390	62,575	64,075	65,600	65,600
Notes:						

Table 4-2 includes the contracted water supply quantities for the four retail purveyors for the years 2020 through 2040. In 2015, none of the purveyors actually took their full contracted amounts due to the implementation of mandatory water conservation measures. ID4 transports water in lined and unlined canals. Unlined canals experience losses to the groundwater table and are counted as groundwater recharge in Table 4-2. Out of District losses are those incurred before water reaches the ID4 system.

Table 4-3
Projected Total Water Demands

Table 4-3 Wholesale: Total Water Demands						
	2015	2020	2025	2030	2035	2040(opt)
Potable and Raw Water <i>From Tables 4-1 and 4-2</i>	45,495	61,390	62,575	64,075	65,600	65,600
Recycled Water Demand* <i>From Table 6-4</i>	0	0	0	0	0	0
TOTAL WATER DEMAND	45,495	61,390	62,575	64,075	65,600	65,600
<i>*Recycled water demand fields will be blank until Table 6-4 is complete.</i>						
NOTES: ID4 does not treat or distribute recycled water. Table 6-4 is not included in this UWMP.						

4.2 Distribution System Water Losses

Legal Requirements:

CWC 10631(e)(1) Quantify, to the extent records are available, past and current water use over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses:...

(J) Distribution system water loss

(3)(A) For the 2015 urban water management plan update, the distribution system water loss shall be quantified for the most recent 12-month period available. For all subsequent updates, the distribution system water loss shall be quantified for each of the five years preceding the plan update.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

ID4 is a wholesale water purveyor that does not have any direct retail customers in the community, and instead sells water to several other water agencies that were discussed in the previous sections. The water loss calculations were performed for ID4's treated water distribution system and were not impacted by any of the water losses that would occur during transport from the other water agencies to the consumer. The finalized water loss found from the analysis performed can be seen in Table 4-4 below.

Table 4-4
12 Month Water Loss Reporting

Table 4-4 Wholesale: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss*
01/2015	1,386

ID4 imports surface water in addition to pumping previously banked groundwater (see Chapter 6, System Supplies). All of the water that is sold to purveyors is metered and billed. Calculations were performed using the American Water Works Association (AWWA) Water Auditing software in the same manner as the years before.

As can be seen in the above table, the overall water loss that occurred is approximately 1,386 afy and the overall AWWA water audit validity score was calculated to be 73/100, which is comparable to previous calculations. A copy of the completed Water Audit Report is included in Appendix C, Distribution System Water Losses.

5 Baseline and Targets

Legal Requirements:

CWC 10608.12 (r) "Urban wholesale water supplier" means a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of water annually at wholesale for potable municipal purposes.

CWC 10608.36 Urban wholesale water suppliers shall include in the urban water management plans . . . an assessment of their present and proposed future measures, programs and policies to help achieve the water use reductions required by this part.

As described in the Water Conservation Act of 2009 (SBX7-7), it is the intent of the California legislature to increase water use efficiency, and the legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. As an urban wholesale water provider, ID4 is not required to establish a baseline and meet targets for daily per capita water use. Rather, this section provides an assessment of current and proposed future measures, programs and policies that will help the purveyors within the ID4's service area achieve their SBX7-7 water use reduction targets.

5.1 Present Measures, Programs and Policies

As described in SBX7-7, it is the intent of the California legislature to increase water use efficiency and the legislature has set a goal of a 20 percent per capita reduction in urban water use statewide by 2020. Wholesalers are to encourage the participation of the retailers in existing conservation programs and welcome the introduction of creative ideas for new and collaborative efforts that will lead to the successful fulfillment of each entity's conservation goals.

As a treated water wholesaler, ID4 assists the retailers in meeting conservation goals primarily through participation in local efforts to educate students in effective water conservation strategies. ID4's efforts are detailed in the 2015 Report of Water Conditions. In brief, programs include:

- **Project WET (Water Education for Teachers):** Project WET promotes the awareness, appreciation, knowledge and stewardship of water resources. Project WET workshops maximize the time engaged in hands-on activities, help educators become familiar with teacher-designed features of the guide and provide opportunities to bounce implementation ideas around with fellow educators.
- **Water Awareness Poster Contest:** Water Awareness Month is celebrated statewide in May, and ID4 celebrates the importance of water in the community by having students express how they can play a part in water conservation. As part of this commitment to water conservation, ID4 holds an annual poster contest for students in grades 1-6. In the 2015 poster contest, over 350 entries were received from 14 different schools within ID4's service area. From those entries, 12 winning posters were selected. The winners received an award of recognition and their posters are displayed on the Agency's website. First, second and third place winners were presented with awards during year-end assemblies.

- Water Education Videos and Lesson Plans
- 3rd to 5th Grade WebQuests: Published on the Agency's website are two Water Education WebQuests. The two WebQuests have been developed for students in grades 3-5. Using the internet, the students are able to explore the world of water.
- Water Education Assemblies: ID4 offers grade-level assemblies and materials to schools located within ID4's service area. All assemblies address Kern County's state and local water supplies, the Henry C. Garnett Water Purification Plant, local groundwater banking programs and water conservation. The lively assemblies include colorful pictures and videos as well as interactive activities for the students to follow. At the conclusion of the assembly, all teachers receive a water education curriculum packet and grade-level educational materials for all students. An effort has been made to integrate many subject areas (science, social studies, English-language arts and art) and to help students develop specific skills (critical thinking, organizing data and predicting)

5.2 Proposed Future Measures, Programs and Policies

Chapter 6, System Supplies, and Chapter 9, Demand Management Measures, of this Plan provide additional information on the types of plans and programs that ID4 intends to implement to support water demand reduction goals.

6 System Supplies

Legal Requirements:

§10631(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).

6.1 Overview

This section describes the current and planned water resources available to ID4 for the 25-year period covered by the Plan. These are summarized in Tables 6-1 and 6-2 and discussed in more detail below.

ID4's water supply consists of SWP Table A water, previously banked groundwater, Central Valley Project (CVP) Section 215 surplus water, and Kern River water. The following sections provide more detailed information on each of these sources.

6.2 Imported (Purchased) Surface Water

6.2.1 State Water Project (SWP)

DWR provides water supply from the SWP to 29 SWP Contractors (Contractors) in exchange for Contractor payment of all costs associated with providing that supply. DWR and each of the Contractors entered into substantially uniform long-term water supply contracts (Contracts) in the 1960s with initial 75-year terms, which thus would begin to expire in 2035. While the Contracts provide for continued water service to the Contractors beyond the initial term, efforts are currently underway to extend the Contracts to improve financing for the SWP.

The majority of the capital costs associated with the development and maintenance of the SWP is financed using revenue bonds. These bonds have historically been sold with 30-year terms. It has become more challenging in recent years to affordably finance capital expenditures for the SWP because bonds used to finance these expenditures are limited to terms that only extend to the year 2035, less than 30 years from now. To ensure continued affordability of debt service to Contractors, it is necessary to extend the term of the Contracts, which will allow DWR to continue to sell bonds with 30-year terms.

Negotiations on extending the Contracts took place between DWR and the Contractors during 2013 and 2014, and were open to the public. The following terms were agreed to and are currently the subject of analysis under the requirements of the California Environmental Quality Act (CEQA) (Notice of Preparation dated September 12, 2014):

- Extend the term of the 29 Water Supply Contracts to December 31, 2085.

- Provide for increased SWP financial operating reserves during the extended term of the Contracts.
- Provide additional funding mechanisms and accounts to address SWP needs and purposes.
- Develop a revised payment methodology with a corresponding billing system that better matches the timing of future SWP revenues to future expenditures.

It is anticipated that the term of the Contracts will be extended to December 31, 2085 and the data and information contained in this Plan reflect that assumption to improve coordination between supply and demand projections beyond the year 2035 as provided in the Act. (CWC section 10631(b).)

The SWP is the largest state-built, multi-purpose water project in the country. It was authorized by the California State Legislature in 1959, with the construction of most initial facilities completed by 1973. Delivery of SWP water into Kern County began in 1968. Today, the SWP includes 28 dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts and is managed by the DWR.

The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. Storage released from Lake Oroville to the Feather River flows down natural river channels into the Sacramento-San Joaquin Delta (Delta). While some SWP supplies are pumped from the northern Delta into the North Bay Aqueduct, the vast majority of SWP supplies are pumped from the southern Delta via the Harvey O. Banks Pumping Plant (Banks PP) into the 444-mile-long California Aqueduct. Several centrally located water districts in the Region lie to the east of the California Aqueduct and receive shares of SWP water through the CVC. CVC conveyance capacity was recently expanded from 922 cubic feet per second (cfs) to 1,422 cfs. This expansion project was completed in 2012.

In the early 1960s, DWR began entering into individual Contracts with urban and agricultural water supply agencies located throughout northern, central, and southern California. The Agency is one of 29 water agencies that have a Contract with DWR. Each Contract contains a “Table A,” which lists the maximum amount of water an agency may request each year throughout the life of the contract. Table A is used in calculating each contractor’s proportionate share, or “allocation,” of the total SWP water supply DWR determines to be available each year. The total planned annual delivery capability of the SWP and the sum of all contractors’ maximum Table A amounts was originally 4.23 million acre-feet (maf). The initial SWP storage facilities were designed to meet Contractors’ water demands in the early years of the SWP, with the construction of additional storage facilities planned as demands increased. However, essentially no additional SWP storage facilities have been constructed since the early 1970s. SWP conveyance facilities were generally designed and have been constructed to deliver maximum Table A amounts to all Contractors. After the permanent retirement of some Table A demands by two Contractors in 1996, following the implementation of the Monterey Amendments, the maximum Table A amounts of all SWP contractors now totals about 4.17 maf. Currently, the Agency’s annual Table A amount is 982,730 af, of which 82,946 af is allocated to ID4. This includes 77,000 af of M&I water, plus 5,946 af of agricultural water supplies.

While Table A identifies the maximum annual amount of water a Contractor may request, the amount of SWP water actually available and allocated to Contractors each year is dependent on a number of factors and varies significantly from year to year. The primary factors affecting SWP supply availability include hydrology, the amount of water in SWP storage at the beginning of the year, regulatory and operational constraints, and the total amount of water requested by SWP contractors. Urban SWP Contractors' requests for SWP water, which were low in the early years of the SWP, have been steadily increasing over time, which increases the competition for limited SWP dry-year supplies. These factors are examined in Chapter 7, Water Supply Reliability.

6.2.1.1 Explanation of 2014 SWP Water Supply Allocation

The extremely dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. Water year 2013 was a year with two hydrologic extremes.¹ October through December 2012 was one of the wettest fall periods on record, but was followed by the driest consecutive 12 months on record. Accordingly, the 2013 SWP supply allocation was a low 35 percent of SWP Table A amounts. The 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and with less stored water available for 2014 supplies. Compounding this low storage situation, 2014 also was an extremely dry year, with runoff for water year 2014 the fourth driest on record. Due to extraordinarily dry conditions in 2013 and 2014, the 2014 SWP water supply allocation was a historically low 5 percent of Table A Amounts. The dry hydrologic conditions that led to the low 2014 SWP water supply allocation were extremely unusual, and to date have not been included in the SWP delivery estimates presented in DWR's 2015 Delivery Capability Report.² It is anticipated that the hydrologic record used in the DWR model will be extended to include the period through 2014 during the next update of the model, which is expected to be completed prior to issuance of the next update to the biennial SWP Delivery Capability Report. For the reasons stated above, this Plan uses a conservative assumption that a 5 percent allocation of SWP Table A Amounts represents the "worst case" scenario.

6.2.2 Central Valley Project (CVP)

The CVP is a set of federal water storage and conveyance facilities that extend from north of Redding to south of Bakersfield. The CVP encompasses two of California's largest river systems, the Sacramento River, which flows southward to the Delta and the San Joaquin River, which flows northward to the Delta.

The Friant Division of the CVP is made up of Friant Dam, which impounds Millerton Lake on the San Joaquin River, the Madera Canal, and the Friant-Kern Canal. Friant Dam stores and delivers annual San Joaquin River flows. The major portion of this water is diverted south through the Friant-Kern Canal.

¹ A water year begins in October and runs through September. For example, water year 2013 is October 2012 through September 2013.

² SWP delivery estimates from DWR's 2015 SWP Delivery Capability Report are from computer model studies which use 82 years of historical hydrologic inflows for the period 1922 through 2003.

The Friant-Kern Canal is approximately 152 miles long and carries water south from Millerton Lake, just north of Fresno, to the Kern River intertie. The Canal has a maximum capacity of 5,000 cfs in its northern reaches, decreasing to 2,000 cfs at its final discharge point into the Kern River, during flood years. However, in most years, its final discharge point is the Arvin-Edison Canal.

CVP Friant Division deliveries are dependent upon the monthly percent allocations determined by the Bureau of Reclamation. ID4 has no annual contracted supply from the CVP, but like other water agencies is able to purchase CVP water in years when high flow supplies are available.

6.2.3 Regulatory Constraints on Availability of Imported Water

Development of Delta Plan and Delta Flow Criteria Pursuant to New State Laws

In November 2009, the California Legislature enacted SBX7-1 as part of a multi-pronged water package related to water supply reliability, ecosystem health, and the Delta.³ Among other things, SBX7-1 created the Delta Stewardship Council (Council) and directed the Council to develop a comprehensive management plan for the Delta by January 1, 2012 (the Delta Plan). In addition, the State Board was directed to develop flow criteria for the Delta to protect public trust resources, including fish, wildlife, recreation and scenic enjoyment, and the California Department of Fish and Game (DFG) was required to identify quantifiable biological objectives and flow criteria for species of concern in the Delta.

In August 2010, the State Board adopted Resolution No. 2010-0039 approving its report entitled “Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem” (Flow Criteria). The State Board report concluded that substantially higher flows were needed through the Delta than had occurred in previous decades in order to benefit zooplankton and various fish species.⁴ Separately, in September 2010, DFG issued a draft report entitled “Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta” (DFG Report). The DFG Report was based on similar biological objectives and recommended Delta flows similar to those set forth in the State Board’s Flow Criteria.⁵ Notably, both the State Board and DFG recognized that their recommended flow criteria for the Delta do *not* balance the public interest or the need to provide an adequate and reliable water supply.⁶ Also of importance, both the State Board and DFG acknowledged that their recommended flow criteria do not have any regulatory or adjudicatory effect; however, they were useful to inform the Delta Plan, and may be considered as the Bay Delta Conservation Plan (BDGP) process moves forward.⁷

³ SBX7-1 became effective February 3, 2010 and adds Division 35 to the California Water Code (commencing with Section 85300). Division 35 is referred to as the Sacramento-San Joaquin Delta Reform Act of 2009.

⁴ (Flow Criteria at 5-8.)

⁵ (DFG Report at 13.)

⁶ (Flow Criteria at 4; DFG Report at 16.)

⁷ (Flow Criteria at 3, 10; DFG Report at ES-4.)

DWR Final 2015 SWP Delivery Capability Report

DWR has for many years biennially prepared the State Water Project Delivery Reliability Report to assist SWP contractors and local planners in assessing the near and long-term availability of supplies from the SWP. DWR issued its most recent update, the 2015 DWR State Water Project Delivery Capability Report (DCR), in July 2015, in a slightly different format with a new title. In the 2015 update, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for use in their 2015 UWMPs. The 2015 DCR includes DWR's estimates of SWP water supply availability under both current and future conditions under four different climate change scenarios.

DWR's estimates of SWP deliveries are based on a computer model that simulates monthly operations of the SWP and CVP systems. Key assumptions and inputs to the model include the facilities included in the system, hydrologic inflows to the system, regulatory and operational constraints on system operations, and projected contractor demands for SWP water. For example, the 2015 DCR uses the following assumptions to model current conditions: existing facilities, hydrologic inflows to the model based on 82 years of historical inflows (1922 through 2003), current regulatory and operational constraints, and contractor demands at maximum Table A Water Amounts.

To evaluate SWP supply availability under future conditions, the 2015 DCR included four model studies. The first of the future-conditions studies, the Early Long Term (ELT) scenario, used all of the same model assumptions for current conditions, but reflected changes expected to occur from climate change, specifically, a 2025 emission level and a 15 cm sea level rise. The other three future-conditions include varying model assumptions related to the BDCP/California Water Fix, such as changes to facilities and/or regulatory and operational constraints.

In spring 2015, DWR announced that BDCP would move from a Section 10 permit to a Section 7 permit process under the Federal Endangered Species Act. As a practical matter, this split the project into two distinct parts known as Cal WaterFix (Alternative 4A), the conveyance portion, and Cal EcoRestore, the restoration portion. Cal WaterFix is Alternative 4A in the recirculated environmental document, and the preferred alternative. Alternative 4A is different than any of the future scenarios modeled by DWR in the DCR. While there is widespread support for the BDCP/Cal WaterFix project, it would be speculative at this time to assume it will move forward. Plans are currently in flux; environmental review is ongoing and is not anticipated to be final until at least 2016, and several regulatory and legal requirements must be met prior to construction.

For purposes of this Plan, the ELT scenario analyzed in Appendix C of DWR's 2015 DCR is deemed to be the most conservative and appropriate study to use for long-term planning estimates of future SWP supply availability. The ELT scenario, based on existing facilities and current operations, adjusted for the expected effects of climate change, is consistent with the studies DWR has used in its previous SWP Delivery Reliability Reports for supply availability under future conditions. Therefore, in this Plan, future SWP supply availability is based on the ELT study included in the 2015 DCR.

6.3 Kern River

The Kern River flows through ID4 and is one of the primary sources of drinking water for the metropolitan Bakersfield area.

The U.S. Army Corps of Engineers and Kern River Watermaster operate the Isabella Dam and Reservoir, which regulates the flow of the Kern River. Approximately 1,300 acres at the eastern end of the reservoir is managed by the US Forest Service for wildlife stewardship.

The Kern River is approximately 164 miles long and is fed by annual snowmelt from the Southern Sierra Nevada, including Mount Whitney. The Kern River originates high in the Sierra Nevada and drains approximately 2,100 square miles of watershed area above Lake Isabella, another 300 square miles of the foothills below Lake Isabella, and about 600 square miles of alluvial fan in the Kern River Canyon (Kern County 1985). The main branch of the River (also called the North Fork Kern River) joins the South Fork Kern River just upstream of Lake Isabella. Minor tributaries are Erskine, Bodfish, Clear, and Cottonwood creeks, which join the river downstream from Lake Isabella. With the exception of the small valley in which Lake Isabella is located, the Kern River and its principal tributaries flow in steep, narrow canyons from their headwaters to the mouth of Kern Canyon, where it debuts onto the Valley floor. Beyond the mouth of the Canyon, the River channel is deeply entrenched in an alluvial fan that extends westward to the main valley trough where the channel is controlled by levees to prevent flood flows from spreading to adjacent lands (City of Bakersfield and County of Kern 2007).

The Kern River had an unregulated flow until 1954, when the Isabella Dam and Reservoir were constructed by the Army Corps of Engineers. The primary purpose of the dam is flood control. Lake Isabella was designed to store approximately 570,000 af of water; however, water storage in the Lake has been limited to approximately 60 percent of capacity since 2006 due to seepage and earthquake concerns, at 340,860 total af.

Pre-construction, engineering and design for what is known as the Isabella Dam Safety Modification Project began in 2013 and is scheduled for completion in 2016. As of December 2015, the project timeline plans for dam and spillway construction to begin in 2017 and be completed by 2022. Further information is available at the project webpage: www.bit.ly/IsabellaDam.

6.4 Groundwater

Groundwater is a significant source of supply and supply reliability. ID4 overlies a portion of the Tulare Lake Hydraulic Region of the San Joaquin Groundwater basin, as defined in California Bulletin 118 published by DWR. This section provides general information on groundwater conditions and reports the amounts of groundwater produced by the Agency and its neighboring water purveyors.

6.4.1 Groundwater Basin Description

Legal Requirements:

CWC 10631 (b) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan: (2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater.

ID4 is located within the Tulare Lake Hydrologic Region, San Joaquin Valley Groundwater Basin (see Table 6-1). Within the Region, 12 groundwater basins are defined. ID4 is within the Kern County subbasin of the San Joaquin Valley Basin, the most extensive of the 12. The Kern subbasin covers the floor of the southern San Joaquin Valley from the Kern County line on the north to the granitic bedrock of the Sierra Nevada, Tehachapi and San Emigdio mountains to the southeast and southwest.

According to Department of Water Resources, California Bulletin 118, the Kern subbasin is in a water-short condition. It is also a non-adjudicated basin. It receives its recharge from the Kern River, which traverses ID4 from east to west, a distance of about 12 miles, through a wide, flat, bed. In the riverbed are 500 to 2,000 foot thick poorly sorted deposits of silt, sand, rock, and clay that originated from the Sierra Nevada, and that provide moderate to high permeability through the riverbed. Historically, flood flows that overflowed on lands on both sides of the Kern River contributed further to groundwater recharge. The groundwater basin is also recharged through percolation of irrigation water as it is conveyed through a number of unlined irrigation canals. Much of the runoff generated by rainfall ends up in unlined canals, drainage basins and the Kern River, providing an additional source of recharge to the underlying aquifer.

**TABLE 6-1
SAN JOAQUIN VALLEY GROUNDWATER BASIN**

Groundwater Basin	DWR Groundwater Basin Number	Surface Area (acres)	Groundwater Storage Capacity (1,000 AF)
San Joaquin Valley Groundwater Basin	5-22.14	1,945,000	4,000

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada mountain and on the north by the Sacramento-San Joaquin Delta and the Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus rivers and the North Fork of the Kings River, connected through the Fresno Slough. The southern portion of the Valley is internally drained by the South Fork of the Kings river, and

the Kaweah, Tule, and Kern rivers that flow into the Tulare drainage basin, which includes the beds of the former Tulare, Buena Vista, and Kern Lakes.

6.4.2 Groundwater Use

Table 6-2 summarizes the last five years of groundwater extractions from the San Joaquin Valley groundwater basin by ID4. Note, ID4 does not typically produce water within its own service area boundaries in normal water years (discussed in more detail in Section 6.6). Most of the groundwater operations occur within the Kern Fan area groundwater banking projects that ID4 participates in that are outside of ID4 boundaries; as shown in Table 6-8.

TABLE 6-2
GROUNDWATER PUMPED BY ID4^{(a)(b)}

Basin Name(s)	2011	2012	2013	2014	2015
San Joaquin Valley - Kern County (5-22.14)					
Total Pumped by ID4 within ID4 Service Area ^(a)	-	-	-	29,036	23,258
Total Pumped by ID4 outside ID4 Service Area ^(b)	-	1,319	30,167	37,045	29,480
Fractured Rock Wells	-	-	-	-	-
Total	-	1,319	30,167	66,081	52,738
Percent of Total Water Supply ^(c)	0.0	2.1	43.4	93.0	72.4

Notes:

- (a) 2011-2015 data provided by ID4, reported water production summary, pumping within ID4
- (b) ID4 Groundwater Banking Accounts - Summary Database
- (c) Total Supply defined as groundwater pumped by ID4 plus SWP supplies

Total groundwater pumping within the ID4 boundary increased from historical averages in 2014 and 2015, due to the limited amount of SWP water available.

6.4.3 Groundwater Replenishment

ID4's groundwater supply is based on the objective of replacing groundwater use with imported, treated surface water in purveyor service areas subject to quality and quantity deficiencies. The replaced pumping, or in-lieu recharge, combined with imported SWP or exchanged Kern River water recharges the underground aquifer. Recharge made possible by water exchanges with river interests commenced in 1971. ID4's operation is based on a fundamental concept of operation in which substantial amounts of imported water are introduced annually into the underground aquifers for groundwater replenishment to correct overdraft.

Absent environmental or drought-induced SWP Table A water amount reductions, the average annual amount available for replenishment is about 23,000 af. Actual amounts spread may vary from about 8,000 af of unavoidable seepage losses to over 90,000 af, depending on local and SWP water conditions and regulation afforded by exchanges.

Since 1971 and through 2015, ID4 has recharged a total of 1,812,891 af to the underlying aquifer. Over the same 44-year period, the total amount of SWP Table A water available for recharge was 898,144 af. The difference of 914,747 af was obtained from exchanges with Kern River or Friant-Kern Canal interests and deliveries recovered from ID4 banking projects. Table 6-3 shows the last five years of groundwater replenishment by source.

TABLE 6-3
HISTORY OF GROUNDWATER REPLENISHMENT WITHIN ID4

	2011	2012	2013	2014	2015
In-District Recharge	37,668	17,465	23,626	22,328	14,491
Banked Water	56,324	-	-	-	-
Total	93,992	17,465	23,626	22,328	14,491

Source: ID4

6.5 Groundwater Banking Programs, Transfers, and Exchanges

6.5.1 Groundwater Banking Programs

ID4 participates in groundwater banking projects that were developed to capture and store high-flow waters, such as Article 21 water from the SWP, Section 215 and flood water from the CVP and flood waters from the Kern River. These groundwater banking projects provide both recharge and recovery facilities dedicated for the storage and recovery of water. ID4's participation in these projects is to provide dry-year supplies during periods of reduced allocation or service interruption on the SWP. Water quality benefits are also realized from ID4's participation in these groundwater banking projects as groundwater recovered from these projects typically is of high quality.

ID4 has carefully structured its participation in the groundwater banking projects to provide sufficient recharge, storage and recovery capacity to meet its water supply obligations.

Table 6-4 provides a summary of the recharge and recovery capacity of its currently operating groundwater banking programs, which are described in more detail below. The amount of water stored within each of the projects over the last five years is provided in Table 6-5.

A description of each project is provided in more detail below.

TABLE 6-4

ID4 GROUNDWATER RECHARGE AND RECOVERY ASSET SUMMARY- (afy)

	2800 Acre Recharge Facility ^(a)	Kern Water Bank	Pioneer Project	Allen Road Complex Well Field	ID4/Rosedale Joint Use Recovery Project	Total
Total Recharge Capacity		450,000	146,000			596,000
Total Recovery Capacity	12,000	230,000	100,000	36,000	21,000	399,000
ID4 Percent Interest	100.00%	9.62%	10%	100%	22%	
ID4 Recharge Capacity		43,290	14,600			57,890
ID4 Recovery Capacity	12,000	22,126	10,000	36,000	5,940	86,066
Summary of Groundwater Banked, (af) ^(b)	31,805	130,806	44,578	-	2,710	209,899

Source: 2015 ID4 Report on Water Conditions

Notes:

(a) ID4 recovery wells and banked water in City of Bakersfield's 2800 Acre Recharge Facility.

(b) Current amount stored in the groundwater banking account.

TABLE 6-5

ID4's GROUNDWATER BANKING PROJECTS

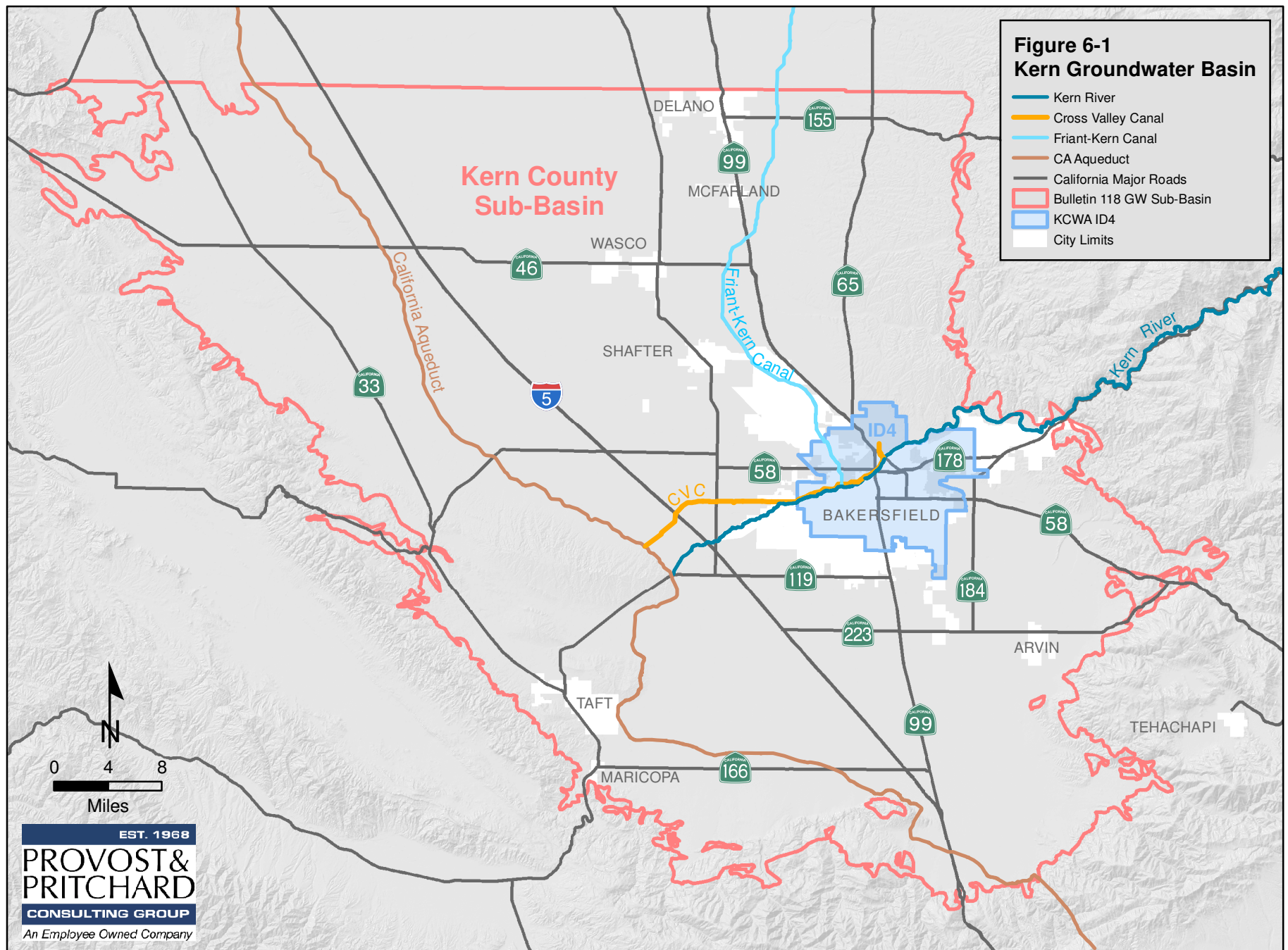
Banking Projects/Facilities	2011	2012	2013	2014	2015
2800 Acre Recharge Facility	61,950	60,631	52,199	37,345	31,805
Kern Water Bank	168,918	168,918	160,029	142,894	130,806
Pioneer Project	55,914	50,914	51,371	47,087	44,578
ID4/Rosedale Joint Use Recovery Project	1,745	4,473	1,170	860	2,710
Total	288,527	284,936	264,769	228,186	209,899

Source: Information provided by ID4

- City of Bakersfield 2800 Acre Recharge Facility:** ID4 currently owns four wells on the City of Bakersfield's 2800 Acre Recharge Facility, located west of Allen Road and south of Stockdale Highway. These wells were drilled and cased in 1999 and remained idle during 2000 and 2001. In 2003, the project was completed with the installation of pumps, motors and pipelines. The

overall recovery capacity for this project is 20 cfs or 12,000 af annually. ID4 currently has approximately 32,000 af of previously banked groundwater stored in the City of Bakersfield's 2800 Acre Recharge Facility available to meet its water supply obligations.

- **Kern Water Bank:** ID4 has a 9.62 percent interest in the recharge and recovery facilities of the Kern Water Bank as a result of the 1996 agreement between Project Participants, the Agency and DWR. As payment for its share of the project, ID4 returned 4,330 af of its SWP firm agricultural entitlement to DWR. This reduction is reflected in current SWP allocations. The number of recovery wells currently available is about 80, yielding a total annual recovery capacity of approximately 230,000 af, of which ID4 has a first priority right to 28,860 af of recovery capacity. The maximum annual recharge capacity of the project is about 450,000 af, of which ID4 has a first priority right to 43,290 af of recharge capacity. ID4 currently has approximately 131,000 af of previously banked groundwater stored in the Kern Water Bank available to meet its water supply obligations.
- **Pioneer Project:** ID4 has a 10 percent interest in the recharge and recovery facilities as a result of the 1998 Pioneer Participation Agreement. The total number of completed wells on the project is 38, which yields a total maximum annual recovery of approximately 100,000 af, of which ID4 has a first priority right to 10,000 af of recovery capacity. ID4's share of the maximum annual recharge capacity of the project is 14,600 af. ID4 currently has approximately 45,000 af of previously banked groundwater stored in the Pioneer Project available to meet its water supply obligations.
- **Allen Road Complex Well Field:** ID4 owns and operates seven wells located along the north side of the Kern River between Allen Road and Coffee Road. These wells may be used as part of joint program with the City of Bakersfield to recover groundwater for discharge into the river channel during dry years for recreational purposes and for potential exchanges with other districts to enhance the quality of water delivered to the Henry C. Garnett Water Purification Plant. These wells are owned and operated by ID4 and are available to ID4 for supply augmentation, using previously banked water within ID4. The total recovery capacity is 36,000 afy.
- **ID4/Rosedale Joint Use Recovery Project:** The Rosedale and ID4 Joint Use Groundwater Recovery Project (JURP) includes seven recovery wells with a total capacity of 45 cfs. ID4 operates this well field to recover banked water for two of Rosedale's partners, Kern-Tulare Water District (Kern-Tulare) and Arvin-Edison Water Storage District (Arvin-Edison). The JURP Agreement also provides ID4 with the ability to exchange surface water for an equal amount of banked water in the Joint Use Groundwater Recovery Project area. ID4 currently has approximately 2,700 af of previously banked groundwater stored in the JURP facility available to meet its water supply obligations.



6.5.2 Groundwater Management

Legal Requirements:

CWC 10631 (b) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

A copy of any groundwater management plan adopted by the urban water supplier... or any other specific authorization for groundwater management.

...For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree.

The Sustainable Groundwater Management Act (SGMA) has modified the requirements for Groundwater Management Plans (GMPs). As of January 2015, Local Agencies may no longer adopt GMPs for high and medium priority basins. ID4 was scheduled to comply with the GMP requirement but is now working towards the creation of a groundwater sustainability agency (GSA) and a groundwater sustainability plan (GSP) in accordance with SGMA through participation in the Kern Groundwater Authority (KGA) and Kern River GSA.

The KGA is a Joint Powers Authority (JPA) consisting of 20 water districts and cities overlying the Kern County Subbasin. The Kern River GSA consists of the City of Bakersfield, ID4 and Kern Delta Water District. Both the KGA and Kern River GSA were formed for the purpose of coordinating groundwater management programs and activities, identifying and addressing issues pertaining to sustainable groundwater management and establishing a framework for local groundwater management.

In addition to working towards the creation of GSP, ID4 records groundwater pumping quantities within its service area boundaries. ID4 produces an annual Report on Water Conditions that provides the pumping and groundwater operations within ID4's boundaries. The report is published annually and adopted by the Agency Board.

Table 6-6
Standard Table 6-1: Groundwater Volume Pumped

Table 6-1 Wholesale: Groundwater Volume Pumped						
L	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type <i>Drop Down List May use each category multiple times</i>	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	San Joaquin Valley 5-22.14	0	1,319	30,167	66,081	52,738
TOTAL		0	1,319	30,167	66,081	52,738
NOTES: There are no fractured rock wells within ID4.						

6.5.3 Overdraft Conditions

Legal Requirements:

CWC 10631(b)(2). For basins that have not been adjudicated, (provide) information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to eliminate the long-term overdraft condition.

The Agency is within the Kern County subbasin of the San Joaquin Valley Basin of the Tulare Lake Basin Hydraulic Region (Region), as defined by DWR Bulletin 118, 2003. The Bulletin does not declare the Basin or subbasin to be in overdraft, but does describe it as being “water short.” The Region has not been adjudicated.

6.5.4 Historical Pumping

Legal Requirements:

CWC 10631 (b) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

3) (Provide a) detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

Table 6-7 presents the projected groundwater pumping by all purveyors within the ID4 service area.

TABLE 6-7

GROUNDWATER PUMPED BY ALL WATER PRODUCING FACILITIES WITHIN ID4 SERVICE AREA

Basin Name(s)	2011	2012	2013	2014	2015
Agricultural	117	63	263	1,657	960
M&I	75,751	77,271	73,677	75,474	74,575
Total	75,868	77,334	73,940	77,131	75,535
Percent Ag. Pumping	0.2	0.1	0.4	2.1	1.3

Source: ID4 2015 Report on Water Conditions

Groundwater produced within the ID4 service area is used to meet the need of M&I users and agricultural demands.

6.6 Storm Water

ID4 has no storm water management role and does not control disposal of storm water within the ID4 service area. Storm water within the ID4 service area is captured either on site or in community retention basins and is allowed to percolate and/or evaporate for disposal. All percolated storm water ends up benefitting the local groundwater basin, though the quantity of water captured to the underground via this mechanism cannot be calculated with the available data.

6.7 Wastewater and Recycled Water

6.7.1 Recycled Water Coordination

Legal Requirements:

CWC 10633 The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

Recycled water programs are important in Kern County due to the fact that the Region mainly consists of a “closed basin,” that is, supplies entering the basin have no natural outlet. Because there is no natural outflow all effluent must be treated and disposed of within the basin. Agriculture, which accounts for the majority of total County water use, does not require water treated to potable water standards. The large amount of agriculture has meant that nearly all wastewater effluent produced by the various treatment facilities in the County can be applied to irrigate salt tolerant non-food crops and environmental habitat restoration. Recycled water is also used to irrigate and flood certain areas of the Kern National Wildlife Refuge.

However, while recycled water has been identified as an important local demand management tool, formal plans to utilize recycled water in specific locations within ID4 have not yet been developed. Increased use of recycled water for irrigated agriculture as well as landscape irrigation in the M&I sector can help lower dependence on high quality SWP water and will provide an additional water source during drought or periods of regulatory restrictions when imported potable water quantities are reduced.

In addition, waste discharges will be greatly reduced and the high quality imported water can be applied towards best use. Wastewater effluent is regulated by the California Code of Federal Regulations (CFR) as well as the Department of Health Services. Municipal treatment facilities producing effluent for introduction into irrigation canals must disinfect to a minimum of 23 most probable number (MPN) of coliform per 100 ml of discharge.

Table 6-8
Standard Table 6-3: Wastewater Treatment and Discharge Within the Service Area

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015										
<input checked="" type="checkbox"/>	Wholesale supplier neither distributes nor provides supplemental treatment to recycled water. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number (optional)	Method of Disposal <i>Drop down list</i>	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level <i>Drop down list</i>	2015 volumes			
							Wastewater Treated	Discharged Treated Waste water	Recycle d Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
Total							0	0	0	0

6.7.2 Recycled Water Systems

Legal Requirements:

CWC 10633(c) (Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

6.7.3 Current Recycled Water Demand & Use

Within the ID4 service area, recycled water is used for irrigation only. Currently, wastewater plant effluent is utilized on irrigated agricultural land in the southeast area of ID4. Effluent from both City of Bakersfield and Kern County sewage treatment plants is used. It is expected that this practice will continue in the future and will improve water levels within the groundwater basin through in-lieu recharge.

Water treated to secondary standards can be used for:

- Orchards with no contact between edible portion and recycled water
- Vineyards with no contact between edible portion and recycled water
- Non food-bearing trees, including Christmas trees
- Fodder crops (e.g., alfalfa) and fiber crops (e.g., cotton)
- Seed crops not eaten by humans
- Ornamental nursery stock, sod farms

Table 6-9

Standard Table 6-4: Current and Projected Retailers Provided Recycled Water Within Service Area

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area							
<input checked="" type="checkbox"/>	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment <i>Drop down list</i>	2015	2020	2025	2030	2035	2040 (opt)
<i>Add additional rows as needed</i>							
Total		0	0	0	0	0	0

Table 6-10

Standard Table 6-5: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
<input checked="" type="checkbox"/>	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
<i>Add additional rows as needed</i>		
Total	0	0

6.8 Desalinated Water Opportunities

Legal Requirements:

§10631(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

The Act requires a discussion of potential opportunities for use of desalinated water (CWC section 10631[i]). ID4 is not in proximity to any brackish ocean water or brackish groundwater supplies. None of these opportunities are practical or economically feasible for implementation, and therefore they are not viable supply sources for either agency.

ID4 could partner with other Contractors and provide financial assistance in construction of other regional groundwater or seawater desalination facilities in exchange for SWP supplies. The desalination water would be supplied to users in communities near the desalination plant, and a similar amount of SWP supplies would be exchanged and allocated to ID4 from the Contractor.

In addition, should such an opportunity emerge with a local agency other than a Contractor, an exchange of SWP deliveries would most likely involve a third party, such as the Metropolitan Water District of Southern California. Most local desalination facilities would be projects implemented by retailers of Contractors and, if an exchange program was implemented, would involve coordination and wheeling of water through the Contractor's facilities to ID4.

6.9 Exchanges or Transfers

Legal Requirements:

<i>§10631(d) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.</i>

ID4 has developed and is currently developing water supply exchanges with other local water districts. These exchanges provide ID4 the ability to call on locally available surface and/or groundwater supplies to meet a shortage on the SWP. Existing exchanges with local water districts are in place that allows ID4 to call upon local supplies, such as Kern River water. These exchanges can be unbalanced in that ID4 may call upon a quantity of water in a given year with a return obligation in a future year. ID4 currently has exchanges in place with North Kern Water Storage District, Rosedale-Rio Bravo Water Storage District and Kern Delta Water District; summarized in Table 6-11.

ID4 and the Kern Delta Water District may exchange up to 50,000 AF on an annual basis. ID4 receives Kern River water from Kern Delta Water District in exchange for a like amount of SWP water. Either district may call on the exchange. ID4 and Rosedale-Rio Bravo Water Storage District may exchange up to 21,000 AF on an annual basis. Rosedale-Rio Bravo initiates the exchange by requesting the return of banked water through the use of the ID4/Rosedale-Rio Bravo Joint Use Project Facility Recovery Wells. ID4 may return water to Rosedale-Rio Bravo through use of the wells or through an exchange of surface water supply. ID4 and North Kern Water Storage District executed a Principles of Agreement for a Long-Term Water Management Agreement (Principles) in 2006. One of the provisions of the Principles includes the development of an annual water exchange for up to 25,000 AF. ID4 will receive Kern River water from North Kern Water Storage District in exchange for a like amount of SWP water.

Table 6-11
Transfer and Exchange Opportunities

Transfer agency	Transfer or exchange	Short term or long term	Proposed Volume	Time Period
Kern Delta Water District	Exchange	Long Term	50,000	2035
Rosedale - Rio Bravo Water Storage District	Exchange	Long Term	21,000	2025
North Kern Water Storage District	Exchange	Long Term	25,000	2035
Total			96,000	
<i>Units : afy</i>				

6.10 Future Water Projects

Legal Requirements:

CWC 10631(g) ...The urban water supplier shall include a detailed description of expected future projects and programs... that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

ID4 is currently implementing the first phase of the CVC Extension Lining Project. The westerly 17 miles of the CVC are concrete-lined to minimize water losses while the easterly 4.5 miles, known as the CVC Extension (Pool No. 7 and No. 8), are unlined. Phase 1 consists of lining Pool No. 7 of the CVC Extension to reduce infiltration losses. This Phase will be constructed starting in 2016 and will be completed in 2017. Phase 2 consists of lining Pool No. 8 and is expected to be constructed within the next 5 years.

By installing the concrete liner, infiltration losses are expected to be reduced by at least 80 percent. Reducing infiltration losses in dry years is especially important as ID4 recovers banked groundwater and delivers it to the Henry C. Garnett Water Purification Plant. By implementing Phase 1, ID4 will be able to reduce groundwater pumping in dry years by an estimated average annual 1,000 af (50,500 af over the 50 year life of the project).

Table 6-12
Standard Table 6-7: Expected Future Water Supply Projects or Programs

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
<input type="checkbox"/>	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
<input type="checkbox"/>	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type <i>Drop Down list</i>	Expected Increase in Water Supply to Agency
	<i>Drop Down Menu</i>	<i>If Yes, Agency Name</i>				
Add additional rows as needed						
CVC Extension Lining - Pool No. 7	No			2017	All Year Types	1,000

6.11 Summary of Existing and Planned Sources of Water

Legal Requirements

CWC 10631

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision 10631(a).

(4) (Provide a) detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

Annual water supplies for ID4 include SWP Table A water, previously banked groundwater, CVP water and Kern River water. ID4 has the potential for additional supplies from short- and long-term exchanges. These multiple sources supply M&I and agricultural uses within ID4. **Table 6-13** summarizes ID4's current water supplies, while **Table 6-14** provides a projection of total water supplies available for the years 2020 through 2040.

Table 6-13 reports the actual quantities of each type of supply received by ID4 in 2015. Note that SWP supply was limited to 20 percent of the Table A amount. Banked water made up the bulk of the shortfall in SWP water, which is what groundwater banking projects are designed to do. Groundwater pumping was roughly equal to pumping in every year since 2010; there has not been a significant increase in groundwater pumping in the most recent two years when SWP supplies have been severely constrained.

For the purposes of **Table 6-14**, “reasonably available” SWP surface water is the projected “normal year” supply, which is defined in the DCR to be 60 percent of the ID4’s Table A amount. Banked Water Recovery is the maximum available per year through participation in groundwater banking projects.

Table 6-13
Standard Table 6-8W: Water Supplies - Actual

Table 6-8 Wholesale: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
<i>Drop down list</i> <i>May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool</i>		Actual Volume	Water Quality <i>Drop Down List</i>	
Add additional rows as needed				
Purchased or Imported Water	SWP Supply	17,103	Raw Water	
Supply from Storage	Banked Water Recovery	41,813	Raw Water	
Total		58,916		

Table 6-14
Standard Table 6-9W: Water Supplies - Projected

Table 6-9 Wholesale: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply <i>Report To the Extent Practicable</i>									
		2020		2025		2030		2035		2040 (opt)	
<i>Drop down list</i> <i>May use each category multiple times. These are the only water supply</i>		Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)
<i>Add additional rows as needed</i>											
Purchased or Imported Water	SWP Supply	49,768		49,768		49,768		49,768		49,768	
Supply from Storage	Banked Water Recovery	86,066		86,066		86,066		86,066		86,066	
Total		135,834	0	135,834	0	135,834	0	135,834	0	135,834	0

6.12 Climate Change Impacts to Supply

6.12.1 Introduction

Kern County is known for its temperate climate with hot, dry summers and cool, humid winters. The increase in greenhouse gas emissions has caused the climate to change and has influenced the existing

system in a major way. A decrease in snowpack, increase in temperature, and changes in water supply and water quality are all consequences of climate change that may become manifest over the 25 year period that is being considered.

The information in the following sections is taken directly and summarized from the Climate Change and Vulnerability Assessment prepared as an addendum to the Tulare Lake Basin portion of the Kern County IRWMP prepared in September, 2014. The Vulnerability Assessment is an extensive document and should be referenced for more detailed information that what is summarized here.

6.12.2 What is Climate Change

“Climate change refers to significant changes in temperature, precipitation, wind patterns and other weather that occur over several decades and beyond. Climatic changes observed in recent decades are occurring due to rising average global temperatures that are the result of elevated levels of gases released primarily by human activities, which trap heat in the atmosphere in a process known as the greenhouse effect. These so-called greenhouse gases (GHGs) include, among others, water vapor, carbon dioxide (CO₂) and methane (CH₄).

Climate change is impacting California water resources in many ways, including through rising sea levels, reduced snowpack, and more frequent and severe droughts. Impacts and vulnerabilities vary by region resulting in the need for tailored actions to ensure the viability of regional watersheds, including the Kern Region. These actions focus on reducing the intensity of climate change through mitigation measures and adapting to climate change effects.”⁸

“Climate change has the potential to have significant impacts on the Kern IRWM Region. The U.S. Bureau of Reclamation (Reclamation), the State of California and others continue to study climate change and its potential impacts on water and other resources in the western states.

The primary climate variables projected by global climate models (GCMs) that are important for water resources planning in California are changes in air temperature, changes in precipitation patterns, and sea level rise. The State of California 2009 Climate Change Impacts Assessment (California Climate Change Center 2009) provides the scientific basis for developing statewide climate change impact projections.”⁹

6.12.3 Potential Impacts

The average annual temperature of Kern County is expected to rise from 61.4°F by 3.5-6.3°F by the end of the 21st Century. Due to this increase in temperature, summer dryness is predicted to start earlier and last longer than it has historically. This change in temperature will increase evaporation, lengthen growing seasons, intensify evapotranspiration, and will lead to drier soils which will require more

⁸ Vulnerability to Climate Change Technical Memo, Kern IRWMP Participants Group, Kennedy/ Jenks Consultants, Page 1, September, 2014

⁹ Id

irrigation water. Increased temperature causes snowpack to melt earlier and at an increased rate, changing the nature of the annual runoff in a way which would require additional storage facilities and heighten the chance of flooding due to overfilling the available on-stream storage.

“Precipitation in the Kern Region is essentially all in the form of rain, and significant shifts in the timing of precipitation are not expected to occur. On average the projections indicate little change in total annual precipitation in California. Furthermore, among several models, precipitation projections do not show a consistent trend during the next century. The Mediterranean seasonal precipitation pattern is expected to continue, with most precipitation falling during winter from North Pacific storms. One of the four climate models projects slightly wetter winters, and another projects slightly drier winters with a 10 to 20 percent decrease in total annual precipitation. However, even modest changes would have a significant impact because California ecosystems are conditioned to historical precipitation levels and water resources are nearly fully utilized.”¹⁰

Increased precipitation under the first model mentioned would likely be a positive for the ID4, potentially increasing average Table A deliveries above the projections in the DCR. Decreased precipitation would potentially have a number of negative impacts including reduced surface supplies. Other potential impacts of reduced precipitation and predicted climate change are included in this tabulation, **Table 6-15**, taken from the IRWMP Technical Memo:¹¹

Table 6-15
Climate Change Vulnerability Assessment Overview

Watershed Characteristics	General Overview of Vulnerabilities
Water Quality	<p>Imported Water – Sea level rise could result in increases in chloride and bromide (a disinfection by-product precursor), potentially requiring changes in drinking water treatment. Increased temperatures could result in an increase in algal blooms and taste and odor events.</p> <p>Regional Surface Water – Increased temperature could result in lower dissolved oxygen, increased algal blooms, and taste and odor affect to the Kern River and its tributaries. Decrease in annual precipitation could result in higher concentrations of contaminants in these surface waters during droughts. Increased wildfire risk and flashier storms could increase turbidity loads for water treatment, irrigation filtration systems and spreading basins (sedimentation and loss of percolation rates).</p> <p>Return flows from groundwater banking programs have inherent water qualities. Increased use of banking projects is leading to replacement of higher quality snowmelt surface water (Kern River and Friant CVP), as these supplies are being diverted further upstream than historical diversions to effect transfers and exchanges, and replaced with groundwater supplies that are higher in salt</p>

¹⁰ Id, p. 8

¹¹ Id, p. 11, Table 2

Watershed Characteristics	General Overview of Vulnerabilities
	constituents (TDS, nitrates, etc.).
Sea Level Rise	The Kern Region is not directly subject to sea level rise. However, potential effects of sea level rise would affect imported water supply conditions. As discussed above, the principal concern is the potential for sea water intrusion to increase Sacramento-San Joaquin Delta (Delta) salinity. While sea level rise is not a direct regional concern, pursuant to the California Ocean Protection Council Resolution adopted March 11, 2011, it should be considered in the project selection/prioritization process.
Flooding	Local surface flows could change as a result of more frequent and intense storm events, leading to more areas susceptible to flooding, and increasing risk of direct flood damage in the Kern Region.
Ecosystem and Habitat	Increased temperature and potential decreases in annual precipitation could put stress on sensitive ecosystems and alter habitats. Water-dependent recreation could also be affected by water quality impacts. In addition, the Kern Region may be subject to increased wildfire risk, which could alter habitat.
Hydropower	Hydropower production in the Kern Region is small, however power through the Western Area Power Administration operated by the BOR does provide power to the CVP. Because of the amount of hydropower used in comparison to the size of the Region is relatively small, climate change effects on hydropower are not considered to be significant.

6.12.4 Potential Mitigation Measures

The overarching theme of the potential impacts due to climate change is one of reduced surface water that will become even more unpredictable on a year-to-year basis, making management of a water system with a fixed demand such as ID4 all the more challenging. Effective mitigation measures will focus on adding stability to the overall supply and managing demand to keep it well within average annual supply.

The Vulnerability assessment identifies a number of what it terms “climate change adaptation strategies,” which are in fact potential mitigation measure. While some of the identified strategies are not feasible, several can be adapted to fit with ID4’s operations. In particular ID4 will be considering the following measures moving forward:

- Working with the retail purveyors first to understand the likely impacts of planned retail DMMs, to more correctly predict overall ID4 demands in future years. It is likely that retail demands in future years will fall short of earlier predictions as new developments incorporating the latest water conservation features and policies are brought on line.

- Continuing with ID4 operating protocols, and making deposits in the available water banking space in years whenever there is surface water available that is surplus to the retail purveyors' demands. The policy should emphasize efficient use of both Table A and other less-reliable surface supplies to keep the water bank reserves as full as practical, against the chance of a run of dry years.
- Look at opportunities to capture excess runoff in off-stream recharge facilities, to make use of water that could otherwise be lost to beneficial uses.

7 Water Supply Reliability

7.1 Overview

Legal Requirements:

CWC 10631 (c)(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources of water demand management measures, to the extent practicable.

CWC 10634 The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

CWC 10635 (a) Every Urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

The Act requires urban water suppliers to assess water supply reliability that compares total projected water use with the expected water supply over the next twenty years in five year increments. The Act also requires an assessment for a single dry year and multiple dry years. This chapter presents the reliability assessment for the ID4 service area.

ID4 is committed to supplying high quality drinking water to consumers served by its Henry C. Garnett Water Purification Plant and strives to achieve the highest standard of customer satisfaction. This Plan helps ID4 achieve these goals even during dry periods based on conservative water supply and demand assumptions over the next 25 years, as discussed in the following sections.

7.2 Reliability of Water Supplies

Legal Requirements:

CWC 10631

(c)(1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

- (A) an average water year,*
- (B) a single dry water year,*

(C) multiple dry water years.

Each water supply source has its own reliability characteristics. One of the reasons ID4 participates in a number of existing groundwater banking projects is to augment surface supply from the SWP. These banking projects provide protection against supply variability resulting from climactic conditions as well as other conditions which may limit or reduce the availability or quality of the SWP supply. Imported SWP supply can fluctuate from year to year depending on precipitation, regulatory restrictions and operational conditions, and is subject to curtailment during dry years. Recent court rulings have also impacted reliability as described in Section 6.2.3.

As discussed in Chapter 6, System Supplies, each Contract contains a Table A amount that identifies the maximum amount of water that a Contractor may request. However, the amount of SWP water actually allocated to Contractors each year is dependent on a number of factors that can vary significantly from year to year. The availability of SWP supplies to ID4 (and the other Contractors) is generally less than their full Table A amounts in all but the wettest years and can be significantly less in very dry years.

The DCR updates DWR's estimate of the current (2015) and future (2035) water delivery reliability of the SWP. Appendix C of the DCR presents the Early Long Term (ELT) alternative scenario, which takes into account a measure of expected climate change, specifically a 2025 emissions level and a 15 cm sea level increase. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be slightly more under current and future conditions, when compared to the report used for ID4's 2010 Plan (SWP Delivery Reliability Report 2009).

In order to adequately assess the reliability of its water supplies, ID4 developed a hydrologic model that includes historical hydrologic data on local as well as SWP water systems. By looking at historic hydrologic information, ID4 staff can estimate future hydrologic conditions and plan accordingly. This model provides the basis for ID4 planning with respect to its participation in exchanges, groundwater banking programs and other water supply decisions. In addition, this model recognizes the availability of Article 21 water from the SWP system and considers this as one of the supply components available to ID4.

Water supplies from other sources, including the CVP and Kern River high-flow waters mentioned in Chapter 6 are typically unregulated with no predictable pattern of yield and therefore are not considered to be part of the ID4 supplies for planning purposes. While ID4 receives supply benefits from these sources when they are available, ID4 does not make long-term planning decisions on the basis of the continued and regular availability of these supplies.

Table 7-1
Basis of Water Year Data

Table 7-1 Wholesale: Basis of Water Year Data			
Year Type	Base Year If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000	Available Supplies if Year Type Repeats	
		<input type="checkbox"/>	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____
		<input checked="" type="checkbox"/>	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available	% of Average Supply
Average Year		135,834	100%
Single-Dry Year	2014	90,213	66%
Multiple-Dry Years 1st Year	1931	113,438	84%
Multiple-Dry Years 2nd Year	1932	92,872	68%
Multiple-Dry Years 3rd Year	1933	84,173	62%
Multiple-Dry Years 4th Year Optional	1934	79,012	58%
Multiple-Dry Years 5th Year Optional			
Multiple-Dry Years 6th Year Optional			

Source: 2015 DWR SWP Capability Report

7.2.1 Types of Years

7.2.1.1 Normal Year

The ELT scenario in the DCR concludes that the normal (or average; the terms are used interchangeably) supply going forward will be 60 percent of Table A amounts. For ID4, this will be 60 percent of 82,946 af, or 49,768 af annually. In addition to SWP supplies, 86,066 af of previously banked groundwater will be available to ID4 in a normal year, for a full normal year supply availability of 135,834 af. Additional analysis of this calculated reliability appears in Section 7.3 below.

7.2.1.2 Single-Dry Year

The extremely dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. Water year 2013 was a year with two hydrologic extremes. October through December 2012 was one of the wettest fall periods on record, but was followed by the driest consecutive 12 months on record. Accordingly, the 2013 SWP supply allocation was a low 35 percent of SWP Table A Amounts. The 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and less stored water available for 2014 supplies.

Compounding this low storage situation, 2014 also was an extremely dry year, with runoff for water year 2014 the fourth driest on record. Due to extraordinarily dry conditions in 2013 and 2014, the 2014 SWP

water supply allocation was a historically low 5 percent of Table A Amounts. The dry hydrologic conditions that led to the low 2014 SWP water supply allocation were extremely unusual, and to date have not been included in the SWP delivery estimates presented in the DCR.

It is anticipated that the hydrologic record used in the DWR model will be extended to include the period through 2014 during the next update of the model, which is expected to be completed prior to issuance of the next update to the biennial SWP Delivery Capability Report in 2017. For the reasons stated above, this Plan uses a conservative assumption that a 5 percent allocation of SWP Table A amounts represents the “worst case” single-dry-year scenario.

In addition to the SWP supply, banked water would be available in a single dry year at the full authorized withdrawal rate of 86,066 af per year, resulting in a total single-dry-year supply of 90,213 af.

7.2.1.3 Multiple-Dry Years

Over the 82-year course of record in the DCR (through 2003), the driest four-year period of record is 1931 through 1934, which experience runoff of 20, 47, 36 and 29 percent of average, respectively, for a four-year average runoff of 33 percent of average per year. In such a series of years, ID4 would receive an average of 27,372 af per year of Table A water. This would be supplemented by banked water. The full 86,066 af would be available the first year, but this amount would fall each year as a drought progressed. Total water supply availability in each of the four years is shown in Table 7-5.

7.3 Water Quality

Legal Requirements:

CWC 10634 The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

The annual surface water supply for ID4 is contracted through the SWP for municipal and industrial needs. Additionally, ID4 has access to water from the CVP and the Kern River through exchanges. These exchanges provide ID4 the ability to mitigate short-term water quality impacts that may be caused by natural or man-made events. By changing sources, water quality is improved and provides an economic and public health benefit.

ID4's water management strategies include routine water quality sampling on each potential available source. A review of the sample results from each source has indicated seasonal variations and short-term variability due to human influences. ID4 has developed a management strategy to prevent source water quality problems using the collected data. The strategy includes development of water exchanges that provide the ability to shift sources to preserve water quality. ID4 is also able to recover banked water that has been stored underground in banking projects. Unlike the surface water supplies, groundwater is not impacted by short term events. Groundwater; however, can be impacted by activities related to land use above and adjacent to the groundwater storage facilities. Activities such as wastewater and sludge disposal, oil production and other activities may, over time, have an impact upon the groundwater quality in the area immediately adjacent to those activities. Each of the groundwater banking projects is actively involved in the preservation of

groundwater quality and limiting activities on or near these facilities which may create adverse impacts to the groundwater quality. Additionally, groundwater contains relatively low levels of natural organic matter making it a preferred alternative source during periods of high organic loading from the surface water supplies.

Protection of source water quality is preferred to the treatment of a contaminant. ID4 actively participates in a number of regional as well as local programs geared towards monitoring and protection of source waters.

7.4 Supply and Demand Assessment

Legal Requirements:

CWC 10635 (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional or local agency population projections within the service area of the urban water supplier.

Normal Year

Each retail water purveyor provided its projected water demands to ID4 based on projects that are under evaluation, are in the planning process, or are the result of the Purveyors' own water planning efforts for its service area. The supply contracts that ID4 has with the purveyors increase the total treated water deliveries to the purveyors from 49,500 afy in 2020 to 53,000 afy in 2035. This information is provided in Table 4-2. To meet these demands, improvements to ID4's Henry C. Garnett Water Purification Plant and transmission facilities have been constructed. The Treated Water Capacity Expansion Project was developed to expand the Henry C. Garnett Water Purification Plant, the North Feeder Pipeline, and the East Feeder Pipeline and to construct the Northwest Feeder Pipeline.

In average and near-average years, surface supplies are sufficient to meet planned demands, with excess supplies being recharged in-district or delivered to ID4 banking projects against the need to draw upon those deposits in dry and multiple dry years.

Table 7-2
Demand Projections Provided To ID4

Water Demand ^(a)	Year					
	2015	2020	2025	2030	2035	2040 ^(c)
ENCSD	11,000	11,000	11,000	11,000	11,000	11,000
COB	6,500	6,500	6,500	6,500	6,500	6,500
CWSC-BAK	19,500	20,500	20,500	20,500	20,500	20,500
NORMWD ^(b)	11,000	11,500	12,500	13,750	15,000	15,000
Total	48,000	49,500	50,500	51,750	53,000	53,000

Notes:

- (a) Water demand values for years 2005 through 2035 based on Exhibit D of the Agreement for a Water Supply executed September 22, 2005.
- (b) Includes projected wholesale deliveries for OMWC.
- (c) 2040 is beyond the term of the current supply contracts. Demands are projected to remain constant, absent better information at the time of report preparation.

Table 7-3
Standard Table 7-2W: Normal Year Supply and Demand Comparison

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals (autofill from Table 6-9)	135,834	135,834	135,834	135,834	135,834
Demand totals (autofill fm Table 4-3)	61,390	62,575	64,075	65,600	65,600
Difference	74,444	73,259	71,759	70,234	70,234

Single Dry Year

In single dry years, ID4's surface water supply is constrained, but the available supply of banked water means total supplies are still well above total demands, and no delivery restrictions are necessary. Table 7-4 demonstrates the forecasted supply/demand relationship for single dry years over the planning horizon.

Overall, available supplies in single dry years exceed planned demands by over 91 percent in 2015. In 2040, despite the increase in planned demand, the excess supply capability is still over 73 percent. It is entirely possible that demand could be reduced in a single dry year. Past experience has shown that imposition of outdoor watering restrictions can reduce overall annual water demand by 10 to 15 percent, and a total ban on outdoor watering can be even more effective, albeit at the cost of great damage to the existing landscaped environment within ID4. This analysis does not consider the effects of such restrictions for two reasons. First, ID4, as a wholesale supplier, does not have the authority to impose water restrictions on retail customers within its service area. Second, as Table 7-6 shows, ID4's water resources are sufficient to meet the demands of a single dry year without demand reduction, while maintaining a significant margin of reserve.

Table 7-4
Standard Table 7-3W: Single Dry Year Supply and Demand Comparison

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	90,213	90,213	90,213	90,213	90,213
Demand totals	61,390	62,575	64,075	65,600	65,600
Difference	28,823	27,638	26,138	24,613	24,613
NOTES:					

Multiple Dry Years

Supply in multiple dry years is based upon the supply that would have been available in 1930-33, which is the driest four-year period on record for the SWP, as reported in the DCR. Table A supplies for each of the four years are supplemented by water bank withdrawals. ID4 has sufficient banked groundwater account balances to allow for more than four years of maximum-rate withdrawal.

Similar to the single dry year analysis, it is believed likely that actual demand, particularly during the latter years of a four-year drought, would be reduced by imposition of outdoor landscape watering restrictions, either by the retail water purveyors, the State of California, or both. As demonstrated in the tables below, demand reduction is not necessary to show adequacy of ID4's water resources over such a difficult period, since existing resources are adequate to meet the full planned demand with margins of reserve of 50 percent to nearly 140 percent depending upon year.

All considered, ID4's water resources are sufficient to provide a high degree of certainty that demands can be met in single dry and multiple dry years of the most severe nature of record.

Table 7-5
Standard Table 7-4W: Multiple Dry Year Supply and Demand Comparison

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040
First year	Supply totals	113,438	113,438	113,438	113,438	113,438
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	52,048	50,863	49,363	47,838	47,838
Second year	Supply totals	92,782	92,782	92,782	92,782	92,782
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	31,392	30,207	28,707	27,182	27,182
Third year	Supply totals	84,176	84,176	84,176	84,176	84,176
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	22,786	21,601	20,101	18,576	18,576
Fourth year (optional)	Supply totals	79,012	79,012	79,012	79,012	79,012
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	17,622	16,437	14,937	13,412	13,412
NOTES:						

7.5 Regional Supply Reliability

Legal Requirements:

CWC 10620(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

Table 7-6 presents ID4's historical total SWP Table A deliveries to its service area.

TABLE 7-6

HISTORICAL TOTAL SWP DELIVERIES

Year	Deliveries (afy)	Year	Deliveries (afy)
1999	82,946	2008	29,031
2000	74,651	2009	33,178
2001	32,349	2010	41,473
2002	58,062	2011	66,357
2003	74,651	2012	53,915
2004	53,915	2013	29,031
2005	74,651	2014	4,147
2006	82,946	2015	16,589
2007	49,768		

Source: ID4 2015 Report on Water Conditions, p 36

In an effort to assess the impacts of these varying conditions on SWP supply reliability, DWR issues the DCR bi-annually. An edition issued in August, 2010, was current through 2009 and was used in preparation of ID4's 2010 Plan. Since that time it has been updated three times more, for 2011 and 2013, and for 2015. The report assists SWP contractors in assessing the reliability of the SWP component of their overall supplies. The DCR updates DWR's estimate of the most current (2015) and future (2035) water delivery reliability of the SWP. The updated analysis shows that the primary component of the annual SWP deliveries (referred to as Table A deliveries) will be slightly improved, under current (base) and future (ELT) conditions, when compared to the preceding reports (State Water Project Delivery Reliability Reports 2009,2011 but very slightly decreased from 2013). The report discusses areas of significant uncertainty to SWP delivery reliability:

- Restrictions on SWP operations due to the State and federal biological opinions to protect endangered fish such as delta smelt and spring-run salmon;
- Climate change and sea level rise, which is altering the hydrologic conditions in the State; and
- The vulnerability of Delta levees to failure due to floods and earthquakes.

In the 2015 Capability Report, DWR provided a recommended set of analyses for Contractors to use in preparing their 2015 UWMPs. Potential deliveries under current conditions are estimated at the 2014 level and assume current methods of conveying water across the Delta and the current operational rules

contained in the federal biological opinions. Potential deliveries under future conditions are estimated at the 2025 level and are also based on the assumptions that no changes will be made in either the way water is conveyed across the Delta or in the operational rules.

The updated analysis in the DCR shows a no change in projected water deliveries on average when compared to the 2009 report using existing facilities operated under current regulatory and operational constraints.

The 2009 report shows SWP annual Table A deliveries averaging 60 percent of the maximum contract amount of 4,133 thousand af (taf) per year (2,485 taf). and projects an annual average of 60 percent (2,480 taf) for the future condition, and the ELT scenario in Appendix C of the 2015 report projects the same 60 percent average delivery under current (2015) and future (2025) conditions. During dry periods, the ELT scenario projects that the four-year drought of 1931 – 1934 would provide 33 percent of maximum SWP Table A. These most recent analyses for the current (2015) condition also project that during years ranging from the wettest 25 percent of years up to the wettest 10 percent of years, 75 to 92 percent of full Table A amounts would be available. 100 percent of full Table A amounts would be available only in the wettest 1 percent of all years.

The variability of SWP deliveries is expected to increase in the future as contractors request larger amounts of their maximum Table A amount. Even though ID4 pays for its full Table A amount of 82,946 af annually, its full Table A amount will not be available every year.

In this Plan, SWP supplies projected to be available for delivery to ID4 were determined based on the total SWP delivery percentages identified by DWR in the DCR. The DCR indicates that the SWP could deliver 60 percent of Table A amounts on a long-term average basis, using existing facilities operated under current regulatory and operational constraints and future anticipated conditions, and with all contractors requesting delivery of their full Table A amounts in most years. Table 7-7 provides the projected SWP water supply to ID4 over the next 25 years; based on the 60 percent of Table A maximum allocation on a long-term average basis using a repeat of 82 years of historical hydrologic conditions from 1922 to 2003.

While the primary supply of water available from the SWP is allocated Table A supply, SWP supplies in addition to Table A water have, until recently, been periodically available, including “Article 21” water, Turnback Pool water, and DWR dry-year purchases. Article 21 water, named for the SWP contract provision defining this supply, is water that may be made available by DWR when excess flows are available in the Delta (i.e., when Delta outflow requirements have been met, SWP storage south of the Delta is full, and conveyance capacity is available beyond that being used for SWP operations and delivery of allocated and scheduled Table A supplies). Article 21 water is made available on an unscheduled and interruptible basis and is typically available only in average to wet years, and usually for only a limited time in the late winter. However, the recent regulatory decisions mentioned above will have significant impacts on the future availability of Article 21 water. What would in past years have been “excess flows,” which have normally made up the bulk of this supply, will now be used to meet new flow requirements for Delta fish species. The availability of Article 21 water is expected to be further limited to only wet and very wet years, with the overall average availability declining substantially, though the impact is difficult to quantify given the variability of annual runoff patterns. ID4 has historically requested and acquired as much Article 21 water as possible to use as in-district recharge or to capture and bank in its banking projects.

The Turnback Pool is a program where contractors with allocated Table A supplies in excess of their service area needs in a given year may offer that excess supply for purchase by other contractors who can use additional supplies that year. The Turnback Pool often has water available in all types of hydrologic years, although as might be expected, in general less water is turned back in dry years. As urban contractor demands have increased over time, the amount of water turned back and available for purchase has diminished. ID4 has historically requested and purchased its share of the Turnback pool to augment its supplies.

In critical dry years, DWR has formed Dry Year Water Purchase Programs for contractors needing additional supplies. Through these programs, water has been purchased by DWR from willing sellers in areas that have had supplies available. That water has then been sold by DWR to interested contractors. Because the availability of these supplies is uncertain, they are not included as quantified supplies in this Plan. However, ID4’s access to these supplies when they are available may enable augmentation of SWP supplies beyond the quantities used throughout this Plan.

Table 7-7 summarizes estimated SWP and banked supply availability to ID4 in a single dry year (based on a repeat of the worst-case historic hydrologic conditions of 2014) and over a multiple dry year period (based on a repeat of the worst-case historic four-year drought of 1931 – 1934). During a dry or critical year as defined by the 5 percent allocation in 2014, the SWP will be able to supply an average of 4,147 AF to ID4. During a multiple dry year period (1931 – 1934), ID4’s SWP supply is estimated to be 33 percent of the Table A amount, or 27,372 AFY.

The values shown in Tables 7-3, 7-4 and 7-7 cover the period 2020 – 2040 based on the DWR estimates at the 2015 level for the current conditions and at the 2025 level for future conditions. They are the

best estimates available for use in developing water management plans for the period 2020 – 2040 for this Plan.

**Table 7-7
ID4 Supply Reliability**

Average/Normal Water Year (af)		Single Dry Water Year ^(b)	Multiple Dry Years ^(c)			
			Year 1	Year 2	Year 3	Year 4
SWP Table A Amount ^(a)						
	49,768	4,147	27,372	27,372	27,372	27,372
% of Normal	60%	5%	33%	33%	33%	33%
Banking Projects ^(d)						
	86,066	86,066	86,066	65,410	56,804	51,640
% Delivery	100%	100%	100%	76%	66%	60%
Supply Summary	135,834	90,213	113,438	92,782	84,176	79,012

Notes:

- (a) The Percentages of SWP Table A amount projected to be available are referenced from DWR's "2015 State Water Project Delivery Capability Report, Appendix C, Early Long-Term Scenario. Supplies are calculated by multiplying ID4's SWP Table A amount of 82,946 AF/year by the referenced percentages.
- (b) Based on worst case historic single dry year of 2014, with an allocation of 5 percent.
- (c) Availability shown is the annual average over four consecutive dry years based on the worst case historic four-year dry period of 1931-1934, or 33 percent per year, plus maximum bank withdrawal.
- (d) Deliveries made from ID4 groundwater banking projects as required by District essential water demand. Groundwater recovery made to supplement SWP Table A supplies. Maximum estimated annual withdrawal is 86,066 afy.

8 Water Shortage Contingency Planning

Legal Requirements:

CWC 10632 (a) The plan shall provide an urban water shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier.

(1) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage.

Water supplies may be interrupted or reduced significantly in a number of ways, such as a drought which limits supplies, earthquake which damages water delivery or storage facilities, a regional power outage, or a toxic spill that affects water quality. This chapter of the Plan describes how ID4 plans to respond to such emergencies so that emergency needs are met promptly and equitably.

8.1 Stages of Action

ID4 will supply all available SWP surface water, less conveyance and process losses, to its contracting purveyors. If the available surface supply is not enough to maintain minimum health and safety, ID4 will pump previously banked groundwater to meet these demands. ID4 has sufficient recovery capacity and banked groundwater to meet all of its current demands.

Table 8-1
Stages of Water Shortage Contingency Plan

Table 8-1 Wholesale		
Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction ¹	Water Supply Condition (Narrative description)
<i>Add additional rows as needed</i>		
1	10%	Combination of limited SWP Supply and constraint in Banked Water recovery
2	25%	Combination of limited SWP Supply and constraint in Banked Water recovery
3	50%	Catastrophic Interruption
¹ One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		

8.2 Prohibitions on End Users

ID4 provides wholesale water only. The purveyors are responsible for implementing mandatory prohibitions against specific water use practices during water shortages.

8.3 Penalties, Charges, and Other Enforcement of Prohibitions

ID4 provides wholesale water only. The purveyors are responsible for implementing mandatory prohibitions against specific water use practices during water shortages.

8.4 Consumption Reduction Methods by Agencies

ID4 provides wholesale water only. The purveyors are responsible for implementing mandatory prohibitions against specific water use practices during water shortages. If it becomes apparent that one or more of ID4's water supplies will be impaired in a given year, ID4 will implement its Water Shortage Contingency Plan to diminish a shortage in treated water by doing on or more of the following actions:

- Temporarily halting or curtailing its spreading of water for recharge in ID4.
- Using ID4 groundwater banking projects or in-district wells.
- Allowing a purveyor to deliver non-ID4 surface water to the Henry C. Garnett Water Purification Plant for treatment.
- Apportioning available treated water among purveyors in proportion to their annual contractual entitlements.

If the combination of supplies after these adjustments is still short of projected demands for the year, ID4 will notify each of the retail purveyors and advise them that their supplies will be constrained, and the estimated percentage of the supply reduction for the year. It will be the responsibility of the retail purveyors to impose such use restrictions on their customers as will be sufficient to limit demand within the available supply.

8.5 Determining Water Shortage Reductions

Legal Requirements:

<i>CWC 10632 (a)(9) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.</i>

ID4 provides wholesale water only. The purveyors are responsible for implementing mandatory prohibitions against specific water use practices during water shortages.

8.6 Revenue and Expenditure Impacts

Legal Requirements:

CWC 10632 (a)(7) An analysis of the impacts of each of the actions and conditions described in paragraphs (1) to (6), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

The agreement between ID4 and its purveyors for a water supply provide for the collection of revenues based upon the amount of water scheduled for delivery to the purveyor, regardless of ID4's ability to deliver the water as a result of water supply shortages. As a result, ID4 revenue resulting from its agreement for a water supply is not subject to reductions corresponding to water supply shortages or allocations. Additionally, as surface water supplies available from ID4 are reduced, a subsequent increase in the ID4 groundwater revenues will be realized as a result of the corresponding increase in groundwater production.

Annual income from treated water sales in 2014-2015 is \$6.2 million for contract entitlement and will increase as the schedule for water deliveries increases. This represents approximately 40 percent of the ID4 budgeted revenues.

8.6.1 Drought Rate Structures and Surcharges

ID4 provides wholesale water only, this section is not applicable.

8.6.2 Management of Revenue Shortfalls Due to Water Shortage

Any reduction in water supply will have some financial effect upon ID4, since water sales and treatment operations are designed to run positive cash flow to pay for ID4 administration and management. Many of the costs in these accounts are fixed, particularly staff labor and benefits, so the savings realized due to a significant fall-off in water deliveries is not in proportion to the loss of revenue.

ID4 will act diligently to control variable costs in proportion to water deliveries, and will take timely action with respect to controlling fixed costs when such steps are feasible. Short-term (within one water year) revenue shortfalls will be covered by ID4's cash reserves.

Shortfalls which are expected to continue for more than one year will be considered relative to ID4's capital improvement plans and existing treated water rate structure. ID4 will postpone capital improvement projects where feasible and adjust rates to correct a long-term shortfall in light of new or changed circumstances.

8.7 Resolution or Ordinance

Legal Requirements:

CWC 10632 (a)(8) A draft water shortage contingency resolution or ordinance.

The Agency Board adopted an ID4 Water Shortage Contingency Plan on April 27, 2011. The Water Shortage Contingency Plan is provided in Appendix D.

8.8 Catastrophic Supply Interruption

Legal Requirements:

CWC 10632 (a)(3) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

8.8.1 General

ID4 is located approximately 45 miles east of the San Andreas Fault, which is along the length of the southern San Joaquin Valley. A major earthquake along this portion of the San Andreas Fault would affect the Valley. The California Division of Mines and Geology has stated two of the aqueduct systems that import water to southern California (including the California Aqueduct) could be ruptured by displacement on the San Andreas Fault, and supply may not be restored for a three to six week period. The situation would be further complicated by physical damage to pumping equipment and local loss of electrical power.

DWR has a contingency aqueduct outage plan for restoring the California Aqueduct to service should a major break occur, which it estimates would take approximately four months to repair.

Extended supply shortages of both groundwater and imported water, due to power outages and/or equipment damage, would be severe until the water supply could be restored.

8.8.2 SWP Emergency Outage Scenarios

In addition to earthquakes, the SWP could experience other emergency outage scenarios. Past examples include slippage of aqueduct side panels into the California Aqueduct near Patterson in the mid-1990s, the Arroyo Pasajero flood event in 1995 (which also destroyed part of Interstate 5 near Los Banos), and various subsidence repairs needed along the East Branch of the Aqueduct since the 1980s. All these outages were short-term in nature (on the order of weeks) and DWR's Operations and Maintenance Division worked diligently to devise methods to keep the Aqueduct in operation while repairs were made. Thus, the SWP contractors experienced no interruption in deliveries.

One of the SWP's important design engineering features is the ability to isolate parts of the system. The Aqueduct is divided into "pools." Thus, if one reservoir or portion of the California Aqueduct is damaged

in some way, other portions of the system can still remain in operation. The Primary SWP facilities are shown on Figure 8-1.

Other events could result in significant outages and potential interruption of service. Examples of possible nature-caused events include a levee breach in the Delta near the Harvey O. Banks Pumping Plant, a flood or earthquake event that severely damaged the Aqueduct along its San Joaquin Valley traverse, or an earthquake event along either the West or East Branches. Such events could impact some or all SWP contractors south of the Delta.

The response of DWR, ID4, and other SWP contractors to such events would be highly dependent on the type and location of any such event. In typical SWP operations, water flowing through the Delta is diverted at the SWP's main pumping facility, located in the southern Delta, and is pumped into the California Aqueduct. During the relatively heavier runoff period in the winter and early spring, Delta diversions generally exceed SWP contractor demands, and the excess is stored in San Luis Reservoir. Storage in SWP aqueduct terminal reservoirs, such as Pyramid and Castaic Lakes, is also refilled during this period. During the summer and fall, when diversions from the Delta are generally more limited and less than contractor demands, releases from San Luis Reservoir are used to make up the difference in deliveries to contractors. The SWP share of maximum storage capacity at San Luis Reservoir is 1,062,000 AF.

Figure 8-1
Primary SWP Facilities



Source: DWR Bulletin 132-05

ID4 receives its SWP deliveries through the main stem of the California Aqueduct at Tupakan.

In addition to SWP storage south of the Delta in San Luis and the terminal reservoirs, a number of contractors have stored water in groundwater banking programs in the San Joaquin Valley, and many also have surface and groundwater storage within their own service areas.

Two scenarios that could impact the delivery to ID4 of its SWP supply, previously banked supplies, or other supplies delivered to it through the California Aqueduct are described below. For each of these scenarios, it was assumed that an outage of six months could occur. ID4's ability to meet demands during the worst of these scenarios is presented following the scenario descriptions.

Scenario 1: Levee Breach near Banks Pumping Plant

As demonstrated by the June 2004 Jones Tract levee breach and previous levee breaks, the Delta's levee system is fragile. The SWP's main pumping facility, the Banks Pumping Plant, is located in the southern Delta. Should a major levee in the Delta near these facilities fail catastrophically, salt water from the eastern portions of San Francisco Bay would flow into the Delta, displacing the fresh water runoff that supplies the SWP. All pumping from the Delta would be disrupted until water quality conditions stabilized and returned to pre-breach conditions. The re-freshening of Delta water quality would require large amounts of additional Delta inflows, which might not be immediately available, depending on the timing of the levee breach. The Jones Tract repairs took several weeks to accomplish and months to complete; a more severe breach could take much longer, during which time pumping from the Delta might not be available on a regular basis.

Assuming that the Banks Pumping Plant would be out of service for six months, DWR could continue making at least some SWP deliveries to all southern California contractors from water stored in San Luis Reservoir. The water available for such deliveries would be dependent on the storage in San Luis Reservoir at the time the outage occurred and could be minimal if it occurred in the late summer or early fall when San Luis Reservoir storage is typically low. Agency water stored in banking programs in the San Joaquin Valley may also be available for withdrawal and delivery to ID4.

Scenario 2: Complete Disruption of the California Aqueduct in the San Joaquin Valley

The 1995 flood event at Arroyo Pasajero demonstrated vulnerabilities of the California Aqueduct (the portion that traverses the San Joaquin Valley from San Luis Reservoir to Edmonston Pumping Plant). Should a similar flood event or an earthquake damage this portion of the aqueduct, deliveries from San Luis Reservoir could be interrupted for a period of time. DWR has informed the SWP contractors that a four-month outage could be expected in such an event. ID4's assumption in this Plan is a six-month outage.

Arroyo Pasajero is located downstream of San Luis Reservoir and upstream of the primary groundwater banking programs in the San Joaquin Valley. Assuming an outage at a location near Arroyo Pasajero that resulted in the California Aqueduct being out of service for six months, supplies from San Luis Reservoir

would not be available to those SWP contractors located downstream of that point. However, ID4 water stored in banking programs in the San Joaquin Valley could be withdrawn and delivered to ID4.

Assuming an outage at a location on the California Aqueduct south of the banking programs in the San Joaquin Valley, these supplies would still be available to ID4.

Scenario 3: Complete Disruption of the Cross Valley Canal at Tupman Turnout on the California Aqueduct

If a major earthquake (an event similar to or greater than the 1994 Northridge earthquake) were to damage this portion of the Aqueduct, deliveries could be interrupted. The exact location of such damage along the Aqueduct would be essential in determining emergency operations by DWR and ID4. For this scenario, it was assumed that the Aqueduct and the CVC turnout at Tupman would suffer a single-location break and deliveries of SWP water from north of the Tupman Turnout would not be available.

In any of these three SWP emergency outage scenarios, DWR and the SWP contractors would coordinate operations to minimize supply disruptions. Depending on the particular outage scenario or outage location, some or all of the SWP contractors south of the Delta might be affected. But even among those contractors, potential impacts would differ given each contractor's specific mix of other supplies and available storage. During past SWP outages, the SWP contractors have worked cooperatively to minimize supply impacts among all contractors. Past examples of such cooperation have included certain SWP contractors agreeing to rely more heavily on alternate supplies, allowing more of the outage-limited SWP supply to be delivered to other contractors; and exchanges among SWP contractors, allowing delivery of one contractor's SWP or other water to another contractor, with that water being returned after the outage was over.

Of these three SWP outage scenarios, the Tupman outage scenario presents the worst-case scenario for ID4. In this scenario, ID4 would rely on water recovered from banking projects, local supplies and water available from the Kern River. An assessment of the supplies available to meet demands in ID4's service area during a six-month Aqueduct/CVC outage and the additional levels of conservation projected to be needed are presented in Table 8-4 for 2015 through 2035.

During an outage, it may still be possible for the CVC to be used for conveyance if the break occurred at the California Aqueduct because of ID4's eastern location. Banked water would be pumped into the CVC and delivered in forward flow to ID4. It is assumed that local well production would be unimpaired by the outage and adequate recovery capacity exists to pump at increased levels during a temporary period. A more conservative estimate has been made, however, with groundwater production was assumed to be one-half of annual supplies.

Table 8-2 shows that, for a six-month emergency outage, additional conservation would be required, with the demand reductions ranging from three to 16 percent of the urban portion of total demand. It

is likely that potential cooperation among SWP contractors and/or temporarily increased purveyor groundwater production during such an outage could increase supplies so that lower amounts, or even no amount, of additional conservation would be needed. However, even without such supply increases, these levels of additional conservation would be readily achievable. In an emergency such as this, these

levels of additional conservation would likely be achieved through voluntary actions, but mandatory measures would be enacted if needed.

Table 8-2
Projected Supply And Demand During 6-Month
Disruption Of Imported Supply System^(a)

	2020	2025	2030	2035
Local Supplies				
Groundwater Banking Projects ^(b)	43,033	43,033	43,033	43,033
Demands				
Total Estimated Demand (w/o Conservation) ^(c)	33,250	33,750	34,375	35,000
Conservation ^(d)	(12,375)	(12,625)	(12,937)	(13,250)
Total Demand (w/Conservation)^(e)	20,875	21,125	21,438	21,750
Additional Conservation Required	0	0	0	0

Notes:

- (a) Assumes complete disruption of in SWP supplies and in deliveries through the California Aqueduct for six months.
- (b) Pumping is assumed to be one-half of average/normal year supplies (86,066 AFY) (see Table 7-7).
- (c) Total demands are assumed to be one-half of average/normal year demands (see Table 7-3).
- (d) Assumes 25 percent reduction on urban portion of total demand by implementation of emergency conservation measures, implemented by retail purveyors.

8.8.3 Regional Power Outage Scenarios

For a major emergency such as an earthquake, Pacific Gas and Electric (PG&E) has declared that in the event of an outage, power would be restored within a 24 hour period. For example, following the Northridge earthquake, Southern California Edison was able to restore power within 19 hours. Edison experienced extensive damage to several key power stations, yet was still able to recover within a 24 hour timeframe.

In the event the SWP or CVC conveyance systems are damaged and are unable to deliver the raw water supply, ID4 has the ability to access an alternative water supply through delivery of Kern River water.

During 1999, ID4 purchased and installed a 1.75 megawatt emergency standby generator capable of providing up to 30 percent of treated water deliveries to the purveyors in the event there was a regional

power outage (ID4 2005 Plan). Between 2008 and 2010 ID4 also installed two 2.0 megawatt generators and a 1.0 megawatt solar photovoltaic facility. Total standby power now equals 6.75 megawatts and will be able to meet up to 80 percent of ID4's demand at full build-out.

In the event of an earthquake, ID4 will assess the areas affected and the amount of damage sustained to ID4's infrastructure and respond to make emergency repairs. In the event the Henry C. Garnett Water Purification Plant is damaged for the treatment of water supplies, ID4 has some short-term treated water storage it can utilize while repairs are made. In the event the treated water transmission pipeline is damaged, ID4 has procedures in place to execute emergency contracts with prequalified contractors to make repairs. All purveyors contracting with ID4 for a delivery of wholesale treated water supplies have access to their own groundwater wells which would be used to supplement deliveries from ID4 during a reduction caused by a catastrophic event.

8.9 Minimum Supply Next Three Years

Legal Requirements: CWC 10632(a)(2) *An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.*

The driest three-year series of SWP deliveries occurred from 2013 through 2015, with deliveries as a percentage of full Table A allocations set at 35, 5 and 20 percent, respectively. Based on ID4's full Table A allocation of 82,946 af, deliveries in those years were 29,031, 4,147 and 16,589 af, for an average of 16,589 af or 20 percent. ID4 can call on its banked supplies up to 86,066 af per year, so long as sufficient water is in the bank. The banked supply is evaluated in Chapter 7 of this Plan, and concludes that the availability over three consecutive dry years would be 86,066, 65,410 and 56,804 af, respectively. The sum of the available SWP and banked water recovery supplies are shown in Table 8-3.

Table 8-3
Standard Table 8-4W: Minimum Supply Next Three Years

Table 8-4 Wholesale: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	102,655	81,999	73,393
NOTES: Supplies are the sum of SWP Table A allocations in the driest three-year period of record (2013-2015) plus reasonably-available banked supply recovery.			

9 Demand Management Measures

Legal Requirements:

CWC 10631 (f) Provide a description of the (wholesale) supplier's water demand management measures. This description shall include all of the following:

(1)(A) ...a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years

(1)(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(ii) Metering.

(iv) Public education and outreach.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, (provide) a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph (B) of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

9.1 Demand Management Measures

9.1.1 Metering

All delivery points to the purveyors are fully metered. Meters are calibrated pursuant to American Water Works Association (AWWA) standard. Replacement is not scheduled but is performed on an as-needed basis.

9.1.2 Public Education and Outreach

The Public Information DMM involves dissemination of information to the public through brochures, press releases, educational flyers, commercials and water conservation flyers.

ID4 has a robust Public Information program. Activities include paid advertising, public service announcements, newsletters, brochures, media events, speaker's bureau, and programs to coordinate with other government agencies.

The ID4 Education program is implemented by the Agency on behalf of its entire wholesale service area. The Agency has been implementing conservation programs for over 25 years and educating local students about the County's (local and state) water supplies and the importance of water and its conservation. Each year, thousands of students in kindergarten through twelfth grade learn about

water treatment, water supply, groundwater and how water is used to grow food and fiber. The Agency is involved in education in a variety of ways: as a Project WET facilitator, programs for levels K through 12 that include assembly programs, video lessons, poster contests and more, as well as a scholarship program. For more information see: http://www.kcwa.com/water_education/index.shtml.

9.1.3 Water Conservation Program Coordination and Staffing Support

ID4 has a Conservation Coordinator on staff at part-time and employs consulting services to staff and program the Public Information programs.

9.1.4 Other Demand Management Measures

ID4 has completed the pre-screening system audit and full-scale audit, maintaining records and implementing a system leak detection program.

9.1.5 Asset Management

ID4 utilizes a computerized asset management system which assists with organizing and scheduling preventative maintenance work orders on a daily, weekly, monthly and annual basis. The computerized asset management system has been in place for 10 years and serves as a data repository for various types of repairs that have been performed on ID4 facilities.

9.1.6 Wholesale Supplier Assistance Programs

ID4 is exploring opportunities for providing financial and/or technical support to its purveyors, with a focus on regional programs as described in the Tulare Lake Basin Portion of Kern County IRWMP.

9.1.7 California Urban Water Conservation Council

In 1991, ID4 became a signatory to the Memorandum of Understanding (MOU) of the California Urban Water Conservation Council (CUWCC) as a wholesaler, and is in compliance with all of the BMPs applicable to wholesale water suppliers. The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, ID4 agreed to implement a series of conservation methods in the ID4 service area, with the cooperation and participation of the purveyors. Those signing the CUWCC MOU have pledged to develop and implement comprehensive conservation Best Management Practices (BMPs). The MOU was compiled with two primary purposes; to expedite implementation of reasonable water conservation measures in urban areas, and to establish assumptions for use in calculating estimates of reliable future water conservation savings resulting from proven and reasonable conservation measures.

The MOU and BMPs were revised by the CUWCC in 2008. ID4 has and will continue to implement the BMPs applicable to a wholesale water agency. ID4 2013-14 BMP reports are included as Appendix E.

10 Plan Adoption, Submittal, and Implementation

10.1 Notice of Public Hearing

A public hearing regarding the Agency ID4 2015 Plan was held on May 26, 2016 at 1:00 P.M. at the following location:

Stuart T. Pyle Water Resources Center
3200 Rio Mirada Drive
Bakersfield, CA 93302

10.1.1 Notice to Cities and Counties

Legal Requirements:

CWC 10621 (b) Every urban water supplier required to prepare a plan shall... at least 60 days prior to the public hearing on the plan ... notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

CWC 10642 The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

In March, 2016, ID4 provided notice to local water purveyors, the City of Bakersfield and Kern County of its Plan update (See Table 2-4). Additionally, ID4 provided notice to local water purveyors, the City of Bakersfield and Kern County, in accordance with the requirements of the Water Code. See Table 10-1. Copies of the notices are included as Appendix B.

Table 10-1
Notification to Cities and Counties

Table 10-1 Wholesale: Notification to Cities and Counties (select one)		
<input type="checkbox"/>	Supplier has notified more than 10 cities or counties in accordance with CWC 10621 (b) and 10642. Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.	
	Provide the page or location of this list in the UWMP.	
<input checked="" type="checkbox"/>	Supplier has notified 10 or fewer cities or counties. Complete the table below.	
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Bakersfield	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
County Name <i>Drop Down List</i>	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Kern County	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
NOTES:		

10.1.2 Notice to the Public

Legal Requirements:

CWC 10642 Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection...Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code...

Government Code 6066: Publication of notice pursuant to this section shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. The period of notice commenced upon the first day of publication and terminates at the end of the fourteenth day, including therein the first day.

The public hearing was advertised in the Bakersfield Californian, a general-interest newspaper of wide circulation in the Bakersfield area. The ad was published once a week for two successive weeks, on May 5 and May 12, 2016, and a copy of the ad is included with Plan, in Appendix B.

10.2 Public Hearing and Adoption

Legal Requirements:

CWC 10642 Prior to adopting a plan, the urban water supplier ...shall hold a public hearing thereon.

CWC 10608.26

(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:

(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.

(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.

(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20 for determining its urban water use target.

ID4 began preparing this Plan in October, 2015. This plan includes all information necessary to meet the requirements of CWC Division 6, Part 2.6 (Urban Water Management Planning). Notice was sent to local water purveyors, the City of Bakersfield and Kern County prior to the public hearing. The public hearing was advertised in the Bakersfield Californian on May 5 and May 12, 2016, pursuant to CWC requirements. Copies of the newspaper advertisements appear in Appendix B.

10.2.1 Adoption

Legal Requirements:

CWC 10642 After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

ID4 held a public hearing and adopted the Plan on May 26, 2016. A copy of the adopting resolution is included in Appendix A.

10.2.2 Plan Submittal

Legal Requirements:

CWC 10621 (d) An urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

CWC 10644 (a) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.

CWC 10635 (b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

Once the Plan has been adopted, a copy of the Plan with any final edits and amendments will be submitted to DWR, the State Library, the City of Bakersfield, Kern County and all participating retail water purveyors.

10.2.3 Submission to DWR

The 2015 Plan, together with all of the required tables, will be submitted electronically by July 1, 2016, through the WUE data online submission tool, as specified by DWR.

10.2.4 Submission to the California State Library

ID4 will submit a CD or hardcopy of the adopted 2015 Plan to the California State Library within 30 days of the adoption date.

10.2.5 Submission to Interested Cities and Counties

ID4 will submit a copy of the 2015 Plan to the City of Bakersfield and Kern County. In addition, ID4 will submit a copy to the following entities:

- California Water Service Company – Bakersfield
- Casa Loma Water Company
- East Niles Community Services District
- North of the River Municipal Water District
- Oildale Mutual Water Company
- Vaughn Mutual Water Company

10.3 Public Availability

Legal Requirements: *CWC 10645 Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.*

ID4 has a history of community outreach and documenting public participation on its planning efforts. For the 2015 Plan, the regular monthly public meetings of the Urban Bakersfield Advisory Committee (UBAC) were utilized as a vehicle to obtain input on the Plan. The draft Plan was made available for review and a public hearing was held to receive comments on May 26, 2016. A copy of the public outreach materials, including paid advertisements and invitation letters, are attached in Appendix B.

The components of public participation included:

Local Media

- Newspaper ads.

Community-based Outreach

- Chambers of commerce, industrial associations, non-profits, environmental groups, town councils and homeowners associations.

Water Agencies Public Participation

- Agency board meetings.

City/County Outreach

- Meetings with local government agencies, planning and public works departments.

Public Availability of Documents

- Locations of availability – public libraries, City Halls, agency websites, etc

10.4 Plan Implementation

Legal Requirements:

CWC 10643 An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

CWC's UWMP requirement applies to every urban water supplier that provides water to 3,000 or more customers, or that provides over 3,000 AF of water annually; these are defined as Purveyors. Purveyors may satisfy the requirements of the CWC by participation in area-wide, regional, watershed, or basin-wide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use. This Plan is being prepared for ID4, which currently has an agreement to provide a wholesale treated water supply to four contracting water purveyors within its service area.

11 Bibliography/References

California Department of Water Resources, 2015 Urban Water Management Plans - Guidebook for Urban Water Suppliers, 2015.

California Department of Water Resources, 2015 State Water Project Delivery Capability Report, 2015

Kern County Water Agency, Improvement District No. 4, 2015 Report of Water Conditions, February, 2016

State of California, 20x2020 Water Conservation Plan, February 2010

The Future Is Now: An Update on Climate Change Science Impacts and Response Options for California, May 2009, California Energy Commission, Public Interest Energy Research Program

Appendix

Appendix A

Adoption Resolution

WHEREAS, Provost & Pritchard Consulting Group has prepared an Urban Water Management Plan update for Improvement District No. 4, a copy of which is on file with the Secretary of the Board of Directors; and

WHEREAS, a public hearing on the Agency's proposed Urban Water Management Plan was held at the Agency headquarters on May 26, 2016 at 1:00 p.m., at which time no objections were made or modifications suggested to the proposed plan; and

WHEREAS, the Agency Board of Directors desires, after consideration of the plan and hearing thereon, to adopt Agency staff's proposed Urban Water Management Plan update, without modifications, as the current plan of the Agency; and

WHEREAS, the Urban Water Management Plan is provided as Exhibit A; and

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of the Kern County Water Agency that:

1. The proposed Urban Water Management Plan update prepared by Provost & Pritchard Consulting Group is adopted as the Urban Water Management Plan for the Kern County Water Agency's Improvement District No. 4; and
2. The General Manager is directed to file the Urban Water Management Plan with the California Department of Water Resources by July 1, 2016.

Appendix B
Notice of Public Hearings & Notification Letters



Directors:

Ted R. Page
President
Division 1

Bruce Hafenfeld
Division 2

Martin Milobar
Division 3

Philip Cerro
Division 4

Charles (Bill) W. Wulff, Jr.
Division 5

Royce Fast
Vice President
Division 6

Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Art Rocha, President
Casa Loma Water Company
1016 Lomita Drive
Bakersfield, CA 93307

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Rocha:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

(661) 634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
3200 Rio Mirada Drive
Bakersfield, CA 93308



Directors:

Ted R. Page
President
Division 1

Bruce Hafenfeld
Division 2

Martin Milobar
Division 3

Philip Cerro
Division 4

Charles (Bill) W. Wulff, Jr.
Division 5

Royce Fast
Vice President
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Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Jim Tyack
North of the River Municipal Water District
P.O. Box 5638
Bakersfield, CA 93388

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Tyack:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A blue ink signature of Curtis L. Creel, written in a cursive style.

Curtis L. Creel
Acting General Manager

(661) 634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
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Bakersfield, CA 93308



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Division 6

Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Tim Ruiz
East Niles Community Services District
1417 Vale Street
Bakersfield, CA 93306

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Ruiz:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

(661) 634-1400

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Vice President
Division 6

Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Alan Tandy, City Manager
City of Bakersfield
1600 Truxtun Avenue
Bakersfield, CA 93301

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Tandy:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A blue ink signature of Curtis L. Creel, written in a cursive style.

Curtis L. Creel
Acting General Manager

(661) 634-1400

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General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Ms. Jacquelyn Kitchen, Planning Director
City of Bakersfield – Community Development
1715 Chester Avenue
Bakersfield, CA 93301

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Ms. Kitchen:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

(661) 634-1400

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General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Ms. Lorelei H. Oviatt AICP, Director
Public Services Building
2700 M Street, Suite 100
Bakersfield, CA 93301-2370

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Ms. Oviatt:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

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Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

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General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Art Chianello, Water Resources Manager
City of Bakersfield, Water Resources Department
1000 Buena Vista Road
Bakersfield, CA 93311

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Chianello:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

ID4 invites input and comment throughout the process. After release of the draft ID4 UWMP in April 2016, the public and all interested agencies will have 30 days to provide comments before the ID4 UWMP is considered for adoption by the Agency Board of the Directors.

Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

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Curtis L. Creel
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James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Doug Nunneley
Oildale Mutual Water Company
2836 McCray Street
Bakersfield, CA 93308

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Nunneley:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

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Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

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Vice President
Division 6

Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Rudy Valles
California Water Service Company
3725 South H Street
Bakersfield, CA 93304

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Valles:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

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Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

(661) 634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
3200 Rio Mirada Drive
Bakersfield, CA 93308



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Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

March 18, 2016

Mr. Van Grayer
Vaugh Water Company
10014 Glenn Street
Bakersfield, CA 93312

Re: Notice of Preparation of the 2015 Urban Water Management Plan for Kern
County Water Agency's Improvement District No. 4

Dear Mr. Grayer:

In accordance with the Urban Water Management Planning Act (California Water Code sections 10610 to 10656), the Kern County Water Agency's (Agency) Improvement District No. 4 (ID4) is required to update its Urban Water Management Plan (UWMP) every five years.

ID4 has begun preparation of the 2015 Update to its Urban Water Management Plan (UWMP). The ID4 UWMP will include a description of the ID4 water system, data on water supplies, baseline water deliveries and use projections over a 20-year horizon, an evaluation of water supply reliability, and discussion of measures to be taken to manage water demands.

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Questions about the UWMP update, or about the process, may be directed to David Beard, ID4 Manager, at (661) 634-1400, or to dbeard@kcwa.com.

Sincerely,

A handwritten signature in blue ink, appearing to read "Curtis L. Creel".

Curtis L. Creel
Acting General Manager

(661) 634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
3200 Rio Mirada Drive
Bakersfield, CA 93308

Beard, Dave

From: Beard, Dave
Sent: Friday, May 13, 2016 3:57 PM
To: 'Jkitchen@bakersfieldcity.us'
Subject: Draft ID4 2015 Urban Water Management Plan

Hi Jacqui-

The draft of Improvement District No. 4's 2015 Urban Water Management Plan (Plan) is available at the following link:

<https://ppeng.sharefile.com/d-s7b9288d8bd846bba>

The Public Hearing to receive comments on the draft Plan is set for 1:00 p.m. on Thursday, May 26, at the Kern County Water Agency's Stuart T. Pyle Water Resources Center, located at 3200 Rio Mirada Drive, Bakersfield, Ca, 93302. Written comments may also be sent to my attention at the same address.

Thanks,

David Beard
Improvement District No. 4
(661) 634-1493

Beard, Dave

From: Beard, Dave
Sent: Friday, May 13, 2016 3:53 PM
To: loreleio@co.kern.ca.us
Subject: Draft ID4 2015 Urban Water Management Plan

Hi Lorelei-

The draft of Improvement District No. 4's 2015 Urban Water Management Plan (Plan) is available at the following link:

<https://ppeng.sharefile.com/d-s7b9288d8bd846bba>

The Public Hearing to receive comments on the draft Plan is set for 1:00 p.m. on Thursday, May 26, at the Kern County Water Agency's Stuart T. Pyle Water Resources Center, located at 3200 Rio Mirada Drive, Bakersfield, Ca, 93302. Written comments may also be sent to my attention at the same address.

Thanks,

David Beard
Improvement District No. 4
(661) 634-1493

Beard, Dave

From: Beard, Dave
Sent: Friday, May 13, 2016 3:51 PM
To: Doug Nunneley (dnunneley@oildalewater.com); Gary Mayberry (garymayberry@gmail.com); Jason Meadors (jmeadors@bakersfieldcity.us); Jim Tyack (08tyackiv@gmail.com); Rudy Valles; steglia@bakersfieldcity.us; Tim Ruiz; Van Grayer (van@vaughnwater.org)
Cc: Semar, Donna
Subject: Draft ID4 2015 Urban Water Management Plan

UBAC Representatives-

The draft of Improvement District No. 4's 2015 Urban Water Management Plan (Plan) is available at the following link:

<https://ppeng.sharefile.com/d-s7b9288d8bd846bba>

The Public Hearing to receive comments on the draft Plan is set for 1:00 p.m. on Thursday, May 26, at the Stuart T. Pyle Water Resources Center.

Thanks,

David Beard
Improvement District No. 4
(661) 634-1493

PROOF OF PUBLICATION

The BAKERSFIELD CALIFORNIAN
P.O. BOX 440
BAKERSFIELD, CA 93302

KERN COUNTY WATER AGENCY
P.O. Box 58
BAKERSFIELD, CA 93302

Ad Number: 14136289 PO #: 37856
Edition: 1TBC Run Times 2
Class Code Legal Notices
Start Date 5/5/2016 Stop Date 5/12/2016
Billing Lines 40 Inches 240.92
Total Cost \$ 135.48 Account 1KCO85
Billing KERN COUNTY WATER AGENCY
Address P.O. Box 58
BAKERSFIELD, CA 93302

STATE OF CALIFORNIA
COUNTY OF KERN

I AM A CITIZEN OF THE UNITED STATES AND A RESIDENT OF THE COUNTY AFORESAID: I AM OVER THE AGE OF EIGHTEEN YEARS, AND NOT A PARTY TO OR INTERESTED IN THE ABOVE ENTITLED MATTER. I AM THE ASSISTANT PRINCIPAL CLERK OF THE PRINTER OF THE BAKERSFIELD CALIFORNIAN, A NEWSPAPER OF GENERAL CIRCULATION, PRINTED AND PUBLISHED DAILY IN THE CITY OF BAKERSFIELD COUNTY OF KERN,

AND WHICH NEWSPAPER HAS BEEN ADJUDGED A NEWSPAPER OF GENERAL CIRCULATION BY THE SUPERIOR COURT OF THE COUNTY OF KERN, STATE OF CALIFORNIA, UNDER DATE OF FEBRUARY 5, 1952, CASE NUMBER 57610; THAT THE NOTICE, OF WHICH THE ANNEXED IS A PRINTED COPY, HAS BEEN PUBLISHED IN EACH REGULAR AND ENTIRE ISSUE OF SAID NEWSPAPER AND NOT IN ANY SUPPLEMENT THEREOF ON THE FOLLOWING DATES, TO WIT: 5/5/16
5/12/16

ALL IN YEAR 2016

I CERTIFY (OR DECLARE) UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT.

DATED AT BAKERSFIELD CALIFORNIA
5.12.16

Solicitor I.D.: 0

First Text
NOTICE OF PUBLIC HEARING URBAN WATER MA

Ad Number 14136289

NOTICE OF PUBLIC HEARING URBAN WATER MANAGEMENT PLANNING ACT CALIFORNIA WATER CODE SECTION 10610, et seq.

All California water suppliers having at least 3,000 urban service connections or providing at least 3,000 acre-feet of urban water supply per year are required to file an Urban Water Management Plan every five years, in years ending in a "5" or a "0." Pursuant to the terms of the Urban Water Management Planning Act, a public hearing will be held to hear issues regarding urban water supply planning within Improvement District No. 4 of the Kern County Water Agency. Please note that the Urban Water Management Planning Act does not pertain to water quality issues and this hearing will not address such issues. The Kern County Water Agency will present its 2015 Urban Water Management Plan on behalf of Improvement District No. 4 at the time and place listed below.

The hearing will be held Thursday, May 26, 2016 at 1:00 p.m. at the following location:

Kern County Water Agency
3200 Rio Mirada Drive
Bakersfield, CA 93308

Lucinda J. Infante
Secretary of the Board of Directors
of the Kern County Water Agency

5/5/2016 & 5/12/2016
14136289

RECEIVED - Kern County Water Agency

JMB <input type="checkbox"/>	ATM <input type="checkbox"/>
CLC <input type="checkbox"/>	DMB <input type="checkbox"/>
BEW <input type="checkbox"/>	SMR <input type="checkbox"/>
HLM <input type="checkbox"/>	NLP <input type="checkbox"/>
LAB <input type="checkbox"/>	CMV <input type="checkbox"/>
MMV <input type="checkbox"/>	DRB <input checked="" type="checkbox"/> SE
MLA <input type="checkbox"/>	DLP <input checked="" type="checkbox"/> SE
<input type="checkbox"/>	LX <input checked="" type="checkbox"/> SE
<input type="checkbox"/>	Scan <input checked="" type="checkbox"/>

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PROOF OF PUBLICATION

The BAKERSFIELD CALIFORNIAN
P.O. BOX 440
BAKERSFIELD, CA 93302

KERN COUNTY WATER AGENCY
P.O. Box 58
BAKERSFIELD, CA 93302

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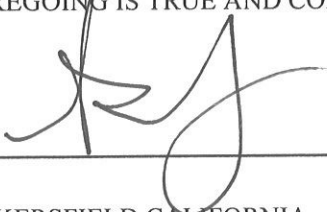
STATE OF CALIFORNIA
COUNTY OF KERN

I AM A CITIZEN OF THE UNITED STATES AND A RESIDENT OF THE COUNTY AFORESAID: I AM OVER THE AGE OF EIGHTEEN YEARS, AND NOT A PARTY TO OR INTERESTED IN THE ABOVE ENTITLED MATTER. I AM THE ASSISTANT PRINCIPAL CLERK OF THE PRINTER OF THE BAKERSFIELD CALIFORNIAN, A NEWSPAPER OF GENERAL CIRCULATION. PRINTED AND PUBLISHED DAILY IN THE CITY OF BAKERSFIELD COUNTY OF KERN,

AND WHICH NEWSPAPER HAS BEEN ADJUDGED A NEWSPAPER OF GENERAL CIRCULATION BY THE SUPERIOR COURT OF THE COUNTY OF KERN, STATE OF CALIFORNIA, UNDER DATE OF FEBRUARY 5, 1952, CASE NUMBER 57610; THAT THE NOTICE, OF WHICH THE ANNEXED IS A PRINTED COPY, HAS BEEN PUBLISHED IN EACH REGULAR AND ENTIRE ISSUE OF SAID NEWSPAPER AND NOT IN ANY SUPPLEMENT THEREOF ON THE FOLLOWING DATES, TO WIT: 5/5/16
5/12/16

ALL IN YEAR 2016

I CERTIFY (OR DECLARE) UNDER PENALTY OF PERJURY THAT THE FOREGOING IS TRUE AND CORRECT.



DATED AT BAKERSFIELD CALIFORNIA

5.12.16

Solicitor I.D.: 0

First Text
NOTICE OF PUBLIC HEARING URBAN WATER MA

Ad Number 14136289

NOTICE OF PUBLIC HEARING
URBAN WATER MANAGEMENT PLANNING
ACT
CALIFORNIA WATER CODE SECTION
10610, et seq.

All California water suppliers having at least 3,000 urban service connections or providing at least 3,000 acre-feet of urban water supply per year are required to file an Urban Water Management Plan every five years, in years ending in a "5" or a "0." Pursuant to the terms of the Urban Water Management Planning Act, a public hearing will be held to hear issues regarding urban water supply planning within Improvement District No. 4 of the Kern County Water Agency. Please note that the Urban Water Management Planning Act does not pertain to water quality issues and this hearing will not address such issues. The Kern County Water Agency will present its 2015 Urban Water Management Plan on behalf of Improvement District No. 4 at the time and place listed below.

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5/5/2016 & 5/12/2016
14136289

Appendix C

Distribution System Water Losses

AWWA Free Water Audit Software v5.0

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This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	David Beard		
Email Address:	dbeard@kcwa.com		
Telephone Ext.:	661-634-1400		493
Name of City / Utility:	Kern County Water Agency		
City/Town/Municipality:	Bakersfield		
State / Province:	California (CA)		
Country:	USA		
Year:	2015	Calendar Year	
Audit Preparation Date:	5/6/2016		
Volume Reporting Units:	Acre-feet		
PWSID / Other ID:			

The following guidance will help you complete the Audit

All audit data are entered on the [Reporting Worksheet](#)

<input type="text"/>	Value can be entered by user
<input type="text"/>	Value calculated based on input data
<input type="text"/>	These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions

The current sheet.
Enter contact information and basic audit details (year, units etc)

Reporting Worksheet

Enter the required data on this worksheet to calculate the water balance and data grading

Comments

Enter comments to explain how values were calculated or to document data sources

Performance Indicators

Review the performance indicators to evaluate the results of the audit

Water Balance

The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard

A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix

Presents the possible grading options for each input component of the audit

Service Connection Diagram

Diagrams depicting possible customer service connection line configurations

Definitions

Use this sheet to understand the terms used in the audit process

Loss Control Planning

Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits

Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements

Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org



AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association
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? Click to access definition
+ Click to add a comment

Water Audit Report for: **Kern County Water Agency**
Reporting Year: **2015** 1/2015 - 12/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

Volume from own sources: + ? n/a 0.000 acre-ft/yr
Water imported: + ? 5 29,035.000 acre-ft/yr
Water exported: + ? n/a 0.000 acre-ft/yr

Master Meter and Supply Error Adjustments

Pcnt: Value:
+ ? 5 1,451.750 acre-ft/yr
+ ? 1,451.750 acre-ft/yr
+ ? 1,451.750 acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 30,486.750 acre-ft/yr

AUTHORIZED CONSUMPTION

Billed metered: + ? 7 28,133.000 acre-ft/yr
Billed unmetered: + ? n/a 0.000 acre-ft/yr
Unbilled metered: + ? 10 955.000 acre-ft/yr
Unbilled unmetered: + ? 10 13.000 acre-ft/yr

AUTHORIZED CONSUMPTION: 29,101.000 acre-ft/yr

Click here: ?
for help using option
buttons below

Pcnt: Value:
13.000 acre-ft/yr

Use buttons to select
percentage of water supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption)

1,385.750 acre-ft/yr

Apparent Losses

Unauthorized consumption: + ? 76.217 acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: + ? 5 899.629 acre-ft/yr
Systematic data handling errors: + ? 10 20.000 acre-ft/yr

Apparent Losses: 995.846 acre-ft/yr

Pcnt: Value:
0.25% 20.000 acre-ft/yr

3.00% 20.000 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 389.904 acre-ft/yr

WATER LOSSES: 1,385.750 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 2,353.750 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains: + ? 10 13.5 miles
Number of active AND inactive service connections: + ? 10 28
Service connection density: ? 2 conn./mile main

Are customer meters typically located at the curbside or property line? Yes

Average length of customer service line: + ?

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 8 156.8 psi

(length of service line, beyond the property boundary,
that is the responsibility of the utility)

COST DATA

Total annual cost of operating water system: + ? 10 \$7,696,184 \$/Year
Customer retail unit cost (applied to Apparent Losses): + ? 10 \$0.97 \$/1000 gallons (US)
Variable production cost (applied to Real Losses): + ? 10 \$198.00 \$/acre-ft ☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 73 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported

2: Customer metering inaccuracies

3: Billed metered



AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0

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Water Audit Report for: **Kern County Water Agency**

Reporting Year: **2015** **1/2015 - 12/2015**

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 73 out of 100 ***

System Attributes:

Apparent Losses:	995.846	acre-ft/yr
+	Real Losses:	389.904 acre-ft/yr
=	Water Losses:	1,385.750 acre-ft/yr

? Unavoidable Annual Real Losses (UARL): See limits in definition acre-ft/yr

Annual cost of Apparent Losses: \$314,763

Annual cost of Real Losses: \$77,201

Valued at **Variable Production Cost**
Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial:

Non-revenue water as percent by volume of Water Supplied: 7.7%

Non-revenue water as percent by cost of operating system: 7.6% Real Losses valued at Variable Production Cost

Operational Efficiency:

Apparent Losses per service connection per day: 31751.21 gallons/connection/day

Real Losses per service connection per day: N/A gallons/connection/day

Real Losses per length of main per day*: 25,784.01 gallons/mile/day

Real Losses per service connection per day per psi pressure: N/A gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): 389.90 acre-feet/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]:

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline



AWWA Free Water Audit Software: User Comments

WAS v5.0

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Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:

Prepared by Brock D. Buche, Provost & Pritchard Engineering Group, March 2016

Audit Item	Comment
Volume from own sources:	Well Production from City's DWR Report No. 38 for 2015 Reporting.
Vol. from own sources: Master meter error adjustment:	Assumed to be 5%.
Water imported:	Water Imported and Treated at City's Surface Water Treatment Plant from City's DWR Report No. 38 for 2015 Reporting.
Water imported: master meter error adjustment:	
Water exported:	This represents water delivered to the Beran Tract's as shown on the H.T.E. Revenue report.
Water exported: master meter error adjustment:	
Billed metered:	Taken from H.T.E. Revenue Report - 2015. $(33,337.09 - 23.17 = 33,313.92)$
Billed unmetered:	Assumed to be none.
Unbilled metered:	Assumed to be none.

Audit Item	Comment
Unbilled unmetered:	Used default percentage, 1.25%
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	Miles of pipeline from Water System Statistical Report January 2016.
Number of active AND inactive service connections:	Number of services from "Number of Active Accounts--CY2015.xlsx"
Average length of customer service line:	
Average operating pressure:	Estimate based on typical telemetry control settings.
Total annual cost of operating water system:	This value was provided from Henry McLaughlin, Water Division Chief Financial Accountant, per telephone conversation in February 2016.
Customer retail unit cost (applied to Apparent Losses):	This is the present rate charged for water per the City of Fresno Master Fee Schedule.
Variable production cost (applied to Real Losses):	Waiting for feedback from Henry.



AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.
Copyright © 2014, All Rights Reserved.Water Audit Report for: **Kern County Water Agency**Reporting Year: **2015****1/2015 - 12/2015**Data Validity Score: **73**

Own Sources (Adjusted for known errors)
--



AWWA Free Water Audit Software: Dashboard

WAS v5.0

American Water Works Association.
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The graphic below is a visual representation of the Water Balance with bar heights proportional to the volume of the audit components

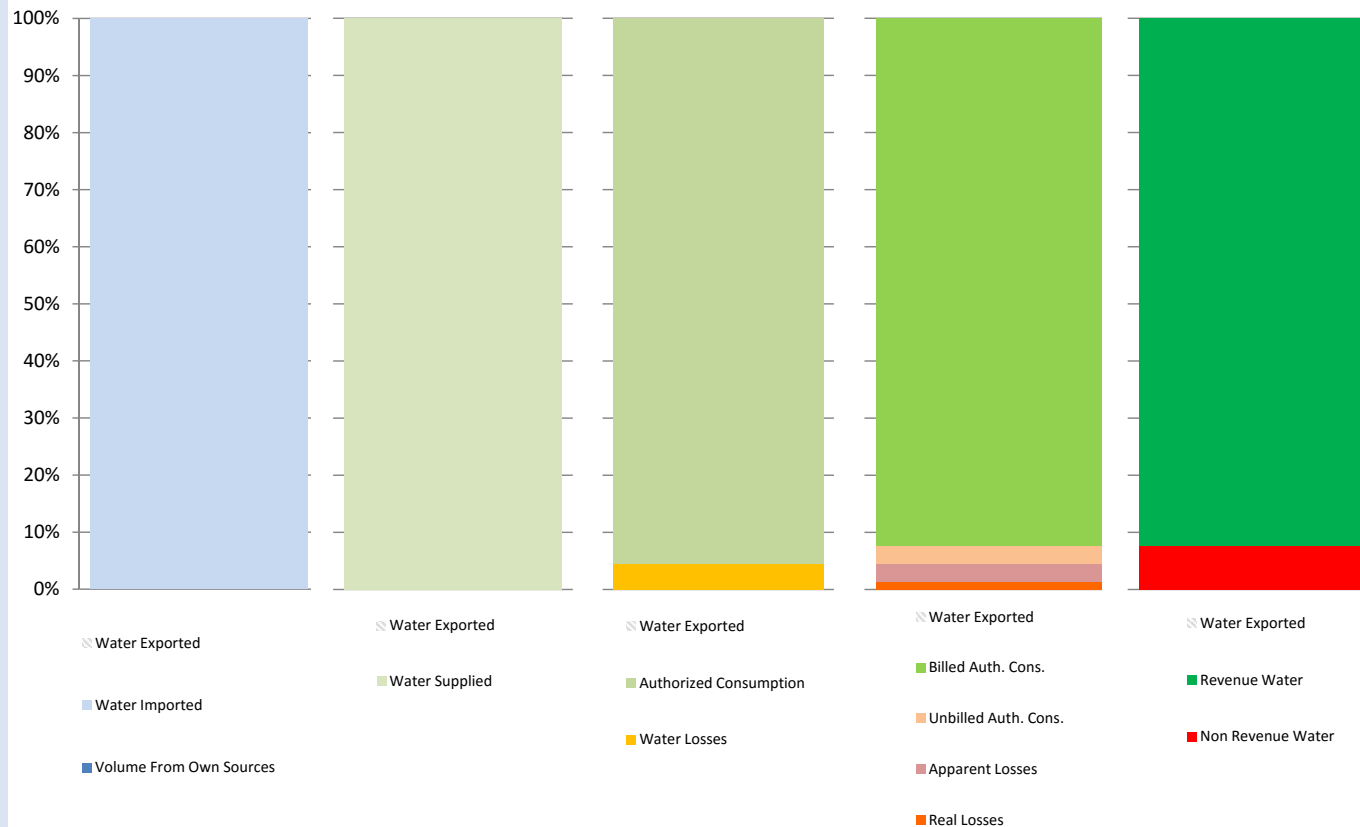
Water Audit Report for: **Kern County Water Agency**

Reporting Year: **2015** **1/2015 - 12/2015**

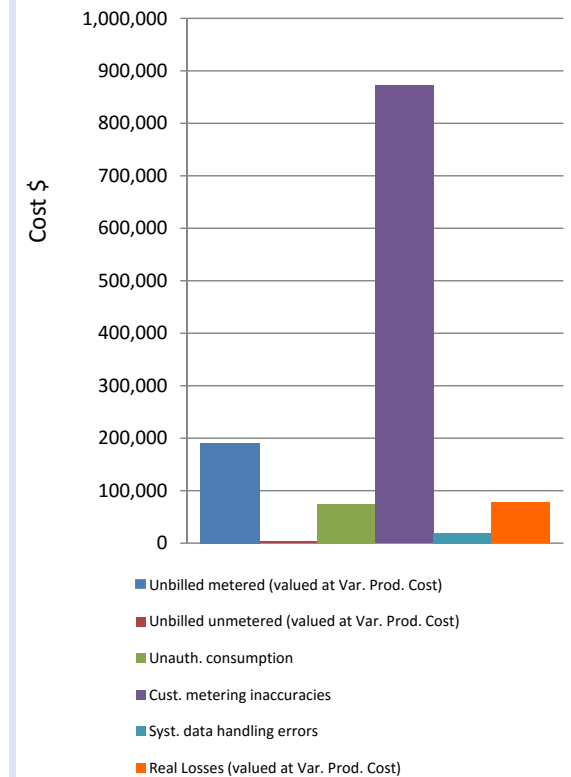
Data Validity Score: **73**

☐ Show me the VOLUME of Non-Revenue Water

☒ Show me the COST of Non-Revenue Water



Total Cost of NRW = \$1,234,835



AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

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The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		<u>to qualify for 2:</u> Organize and launch efforts to collect data for determining volume from own sources	<u>to qualify for 4:</u> Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		<u>to qualify for 8:</u> Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system; tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		<u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	<u>to qualify for 4:</u> Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		<u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		<u>to qualify for 8:</u> Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		<u>to qualify for 10:</u> Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		<u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.)		<u>to qualify for 2:</u> Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	<u>To qualify for 4:</u> Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		<u>to qualify for 6:</u> Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		<u>to qualify for 8:</u> Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		<u>to qualify for 10:</u> Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		<u>to maintain 10:</u> Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Importer. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined. Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		<p><u>to qualify for 2:</u> Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.</p>	<p><u>to qualify for 4:</u> Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.</p>		<p><u>to qualify for 6:</u> Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.</p>		<p><u>to qualify for 8:</u> Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.</p>		<p><u>to qualify for 10:</u> Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.</p>		<p><u>to maintain 10:</u> Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.</p>
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducted by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; <u>or</u> at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; <u>or</u> minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	<p><u>to qualify for 2:</u> Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.</p>	<p><u>to qualify for 4:</u> Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.</p>		<p><u>to qualify for 6:</u> Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.</p>		<p><u>to qualify for 8:</u> Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; <u>or</u> otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.</p>		<p><u>to qualify for 10:</u> Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.</p>		<p><u>to maintain 10:</u> Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.</p>
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does <u>not</u> require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does <u>not</u> require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy <u>does</u> require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy <u>does</u> require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy <u>does</u> require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy <u>does</u> require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		<p><u>to qualify for 2:</u> Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.</p>	<p><u>to qualify for 4:</u> Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.</p>		<p><u>to qualify for 6:</u> Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts</p>		<p><u>to qualify for 8:</u> Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.</p>		<p><u>to qualify for 10:</u> Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.</p>		<p><u>to maintain 10:</u> Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.</p>
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	<p>Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.</p>	<p>Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.</p>	Conditions between 2 and 4	<p>Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.</p>	Conditions between 4 and 6	<p>Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.</p>	Conditions between 6 and 8	<p>Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.</p>	Conditions between 8 and 10	<p>Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.</p>
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		<p><u>to qualify for 2:</u> Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.</p>	<p><u>to qualify for 4:</u> Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.</p>		<p><u>to qualify for 6:</u> Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.</p>		<p><u>to qualify for 8:</u> Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.</p>		<p><u>to qualify for 10:</u> Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.</p>		<p><u>to maintain 10:</u> Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.</p>
Unbilled unmetered:		<p>Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.</p>	<p>Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.</p>	Conditions between 2 and 4	<p>Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).</p>	Default value of 1.25% of system input volume is employed	<p>Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.</p>	Conditions between 6 and 8	<p>Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.</p>	Conditions between 8 and 10	<p>Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.</p>
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		<p><u>to qualify for 5:</u> Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use.</p> <p><u>to qualify for 2:</u> Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).</p>	<p><u>to qualify for 5:</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use.</p> <p><u>to qualify for 4:</u> Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).</p>		<p><u>to qualify for 5:</u> Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quantity component, and other larger-quantity components should take priority.</p>	<p><u>to qualify for 6 or greater:</u> Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.</p>	<p><u>to qualify for 8:</u> Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.</p>		<p><u>to qualify for 10:</u> Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.</p>		<p><u>to maintain 10:</u> Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.</p>
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedure internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in an uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographic Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water	Gratings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gratings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Worksheet asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet. b). Meters exist inside customer buildings, or properties are unnumbered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		<u>to qualify for 2:</u> Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	<u>to qualify for 4:</u> Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		<u>to qualify for 6:</u> Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		<u>to qualify for 8:</u> Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		<u>to qualify for 10:</u> Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		<u>to maintain 10:</u> Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breach pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breach pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		<u>to qualify for 2:</u> Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	<u>to qualify for 4:</u> Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		<u>to qualify for 6:</u> Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		<u>to qualify for 8:</u> Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		<u>to qualify for 10:</u> Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		<u>to maintain 10:</u> Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		<u>to qualify for 2:</u> Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		<u>to qualify for 8:</u> Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		<u>to qualify for 2:</u> Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	<u>to qualify for 4:</u> Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		<u>to qualify for 6:</u> Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	<u>Launch effort to fully meter the customer population and charge rates based upon water volumes</u>	<u>to qualify for 8:</u> Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to qualify for 10:</u> Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		<u>to maintain 10:</u> Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis, or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		<u>to qualify for 2:</u> Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	<u>to qualify for 4:</u> Implement an electronic cost accounting system, structured according to accounting standards for water utilities		<u>to qualify for 6:</u> Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		<u>to qualify for 8:</u> Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		<u>to qualify for 10:</u> Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		<u>to maintain 10:</u> Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively



AWWA Free Water Audit Software: Customer Service Line Diagrams

WAS v5.0

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Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, L_p , for the three most common piping configurations.

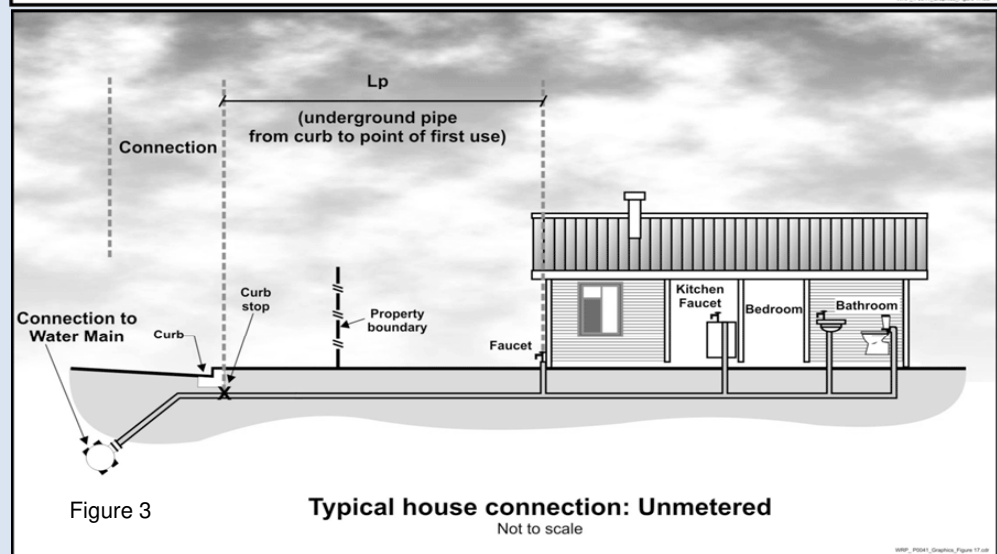
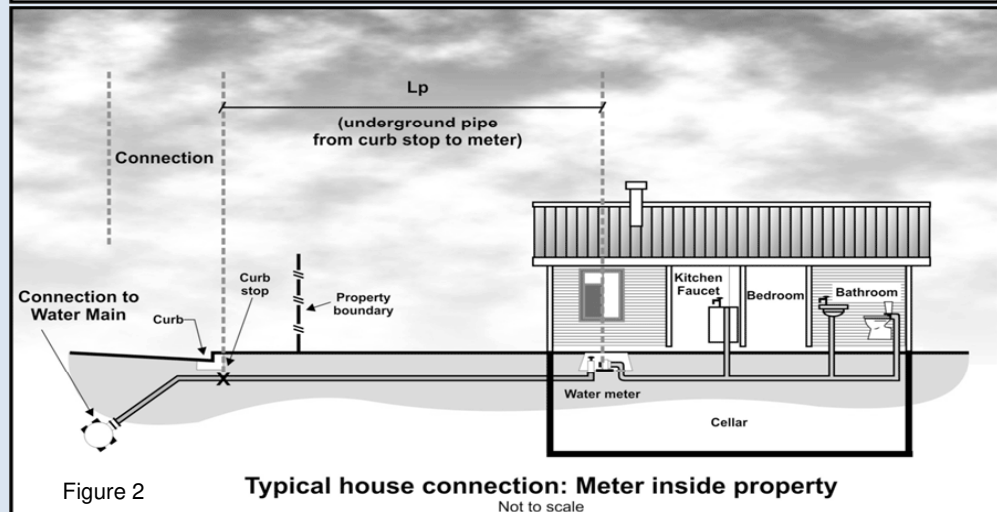
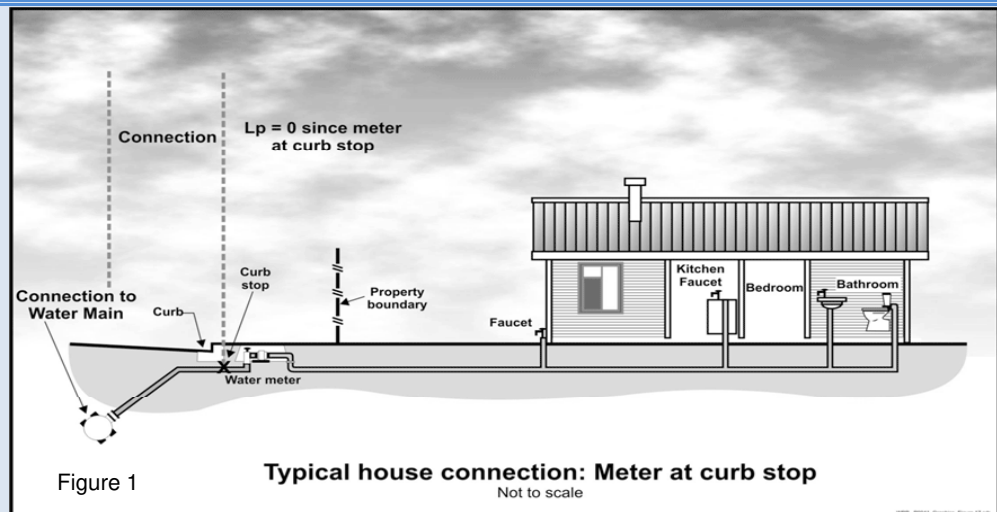
Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration $L_p = 0$ since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where L_p is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building, where L_p is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the L_p will vary notably in a community of different structures, therefore the average L_p value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

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AWWA Free Water Audit Software: Definitions

WAS v5.0

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Item Name	Description
Apparent Losses Find	<p>= unauthorized consumption + customer metering inaccuracies + systematic data handling errors</p> <p>Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use).</p> <p>NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.</p>
AUTHORIZED CONSUMPTION Find	<p>= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption</p> <p>The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes.</p> <p>Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.</p> <p>Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)</p>
View Service Connection Diagram Average length of customer service line Find	<p>This is the average length of customer service line, Lp, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of Lp is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping.</p> <p>If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10.</p> <p>If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average Lp length based upon the various customer land parcel sizes and building locations in the service area. Lp will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average Lp length for the entire system.</p> <p>Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, Lp, for each configuration.</p>
Average operating pressure Find	<p>This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.</p>
Billed Authorized Consumption	<p>All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.</p>
Billed metered consumption Find	<p>All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component. The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.</p>
Billed unmetered consumption Find	<p>All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined <u>by utility policy</u> to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.</p>

Item Name	Description
Customer metering inaccuracies Find	<p>Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger.</p> <p>The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for <u>all</u> customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly.</p> <p>Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.</p>
Customer retail unit cost Find	<p>The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, <u>but only if</u> these charges are based upon the volume of potable water consumed.</p> <p>For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer.</p> <p>Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either \$/1,000 gallons, \$/hundred cubic feet, or \$/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, \$.</p>
Infrastructure Leakage Index (ILI) Find	<p>The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.</p>
Length of mains Find	<p>Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as:</p> <p>Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]</p>
NON-REVENUE WATER Find	<p>= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.</p>
Number of active AND inactive service connections Find	<p>Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hydrants should be included in the "Length of mains" parameter.</p>
Real Losses Find	<p>Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.</p>
Revenue Water	<p>Those components of System Input Volume that are billed and have the potential to produce revenue.</p>
Service Connection Density Find	<p>=number of customer service connections / length of mains</p>

Item Name	Description
Systematic data handling errors <div>Find</div>	<p>Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports.</p> <p>Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component.</p> <p>Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. <u>Data Transfer Errors</u> result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors.</p> <p>Apparent losses also occur from <u>Data Analysis Errors</u> in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system.</p> <p>Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors.</p> <p>If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor <u>has</u> investigated the billing system and its controls, and <u>has</u> well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. <u>Note:</u> negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.</p>
Total annual cost of operating the water system <div>Find</div>	<p>These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.</p>
Unauthorized consumption <div>Find</div>	<p>Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system.</p> <p>Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.</p>
Unavoidable Annual Real Losses (UARL) <div>Find</div>	<p>UARL (gallons/day)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres/day)=(18.0Lm + 0.8Nc + 25.0Lc) xP</p> <p>where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres)</p> <p>The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both.</p> <p>NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If,</p> <p><u>in gallons per day:</u> (Lm x 32) + Nc < 3000 or P < 35psi</p> <p><u>in litres per day:</u> (Lm x 20) + Nc < 3000 or P < 25m</p> <p>then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.</p>

Item Name	Description
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.
Unbilled metered consumption	Metered consumption which is authorized by the water utility, but, for any reason, is <u>deemed by utility policy</u> to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. It does not include water supplied to neighboring utilities (water exported) which may be metered but not billed.
Unbilled unmetered consumption	<p>Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case. This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value.</p> <p>If the water utility <u>has</u> carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities.</p> <p>Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.</p>
Units and Conversions	<p>The user may develop an audit based on one of three unit selections:</p> <p>1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet</p> <p>Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes):</p> <div><div>Enter Units:</div><div>Convert From...</div><div>=</div><div>Converts to....</div></div> <div><div>1</div><div>Million Gallons (US)</div><div></div><div>3.06888329</div><div>Acre-feet</div></div> <div>(conversion factor = 3.06888328973723)</div>
Use of Option Buttons	<p>To use the default percent value choose this button</p> <p>To enter a value choose this button and enter the value in the cell to the right</p> <div><div>Pcnt:</div><div>Value:</div></div> <div><div>1.25%</div><div><input checked="" type="radio"/></div><div><input type="radio"/></div><div></div></div> <p>NOTE: For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above.</p> <p>If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).</p>
Variable production cost (applied to Real Losses)	<p>The cost to produce and supply the next unit of water (e.g., \$/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable.</p> <p>It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost.</p> <p>The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.</p>
Volume from own sources	<p>The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of <u>treated</u> drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.</p>

Item Name	Description
Volume from own sources: Master meter and supply error adjustment <input type="button" value="Find"/>	<p>An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.</p>
Water exported <input type="button" value="Find"/>	<p>The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water.</p> <p>Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.</p>
Water exported: Master meter and supply error adjustment <input type="button" value="Find"/>	<p>An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.</p>
Water imported <input type="button" value="Find"/>	<p>The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.</p>
Water imported: Master meter and supply error adjustment <input type="button" value="Find"/>	<p>An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.</p>
WATER LOSSES <input type="button" value="Find"/>	<p>= apparent losses + real losses</p> <p>Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.</p>



AWWA Free Water Audit Software: Determining Water Loss Standing

WAS v5.0

American Water Works Association.
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Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service
For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.					

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities in gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 - 5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		



AWWA Free Water Audit Software: Examples of Completed and Validated Audits

WAS v5.0

American Water Works Association.
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Example 1a: Million Gallons:

Example 1b: Million Gallons:
Performance IndicatorsExample 2a: Megalitres:
Reporting WorksheetExample 2b: Megalitres:
Reporting Worksheet

Example Audit 1a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

American Water Works Association.
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? Click to access definition
+ Click to add a comment

Water Audit Report for: **City of Asheville (01-11-010)**
Reporting Year: **2013** 7/2012 - 6/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

Volume from own sources: + ? 7 7,352.880 MG/Yr
Water imported: + ? n/a 0.000 MG/Yr
Water exported: + ? n/a 0.000 MG/Yr

Master Meter Error Adjustments

Pcnt: Value:
+ ? 3 285.450 MG/Yr
+ ? 0 0.000 MG/Yr
+ ? 0 0.000 MG/Yr

WATER SUPPLIED: 7,067.430 MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Billed metered: + ? 8 4,782.250 MG/Yr
Billed unmetered: + ? n/a 0.000 MG/Yr
Unbilled metered: + ? 7 27.757 MG/Yr
Unbilled unmetered: + ? 8 157.790 MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

AUTHORIZED CONSUMPTION: 4,967.797 MG/Yr

Click here: ?
for help using option
buttons below

Pcnt: Value:
0.25% 157.790 MG/Yr

Use buttons to select
percentage of water
supplied
OR
value

Pcnt: Value:
0.25% 0.25% MG/Yr

2.26% 0.25% MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

2,099.633 MG/Yr

Apparent Losses

Unauthorized consumption: + ? 17.669 MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: + ? 7 111.220 MG/Yr
Systematic data handling errors: + ? 5 11.956 MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 140.844 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 1,958.789 MG/Yr

WATER LOSSES: 2,099.633 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 2,285.180 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains: + ? 4 1,236.5 miles
Number of active AND inactive service connections: + ? 7 55,256
Service connection density: ? 45 conn./mile main

Are customer meters typically located at the curbstop or property line? Yes (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: + ? 4 145.3 psi

COST DATA

Total annual cost of operating water system: + ? 10 \$33,630,676 \$/Year
Customer retail unit cost (applied to Apparent Losses): + ? 10 \$3.22 \$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses): + ? 6 \$335.94 \$/Million gallons ☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 72 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Variable production cost (applied to Real Losses)

3: Unauthorized consumption



Example Audit 1b:

AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0
American Water Works Association.
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Water Audit Report for: **City of Asheville (01-11-010)**

Reporting Year: **2013** **7/2012 - 6/2013**

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

Apparent Losses: **140.844** MG/Yr
+ Real Losses: **1,958.789** MG/Yr
= **Water Losses: 2,099.633** MG/Yr

? Unavoidable Annual Real Losses (UARL): **794.34** MG/Yr

Annual cost of Apparent Losses: **\$606,265**

Annual cost of Real Losses: **\$658,036**

Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial: { Non-revenue water as percent by volume of Water Supplied: **32.3%**
Non-revenue water as percent by cost of operating system: **3.9%** Real Losses valued at Variable Production Cost

Operational Efficiency: { Apparent Losses per service connection per day: **6.98** gallons/connection/day
Real Losses per service connection per day: **97.12** gallons/connection/day
Real Losses per length of main per day*: **N/A**
Real Losses per service connection per day per psi pressure: **0.67** gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL): **1,958.79** million gallons/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]: **2.47**

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline



Example Audit 2a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

American Water Works Association.
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? Click to access definition
+ Click to add a comment

Water Audit Report for: **The City of Calgary**
Reporting Year: **2013** 1/2013 - 12/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MEGALITRES (THOUSAND CUBIC METRES) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

WATER SUPPLIED

Volume from own sources: + ? 7 174,324.000 ML/Yr
Water imported: + ? n/a 0.000 ML/Yr
Water exported: + ? 7 8,190.131 ML/Yr

Master Meter Error Adjustments

Pcnt: Value:
1.00% 1.00% ML/Yr
1.00% 1.00% ML/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 164,488.979 ML/Yr

AUTHORIZED CONSUMPTION

Billed metered: + ? 6 125,111.268 ML/Yr
Billed unmetered: + ? 8 3,503.386 ML/Yr
Unbilled metered: + ? 7 166.157 ML/Yr
Unbilled unmetered: + ? 6 1,444.000 ML/Yr

Click here: ?
for help using option
buttons below

Pcnt: Value:
1,444.000 ML/Yr

Use buttons to select
percentage of water
supplied
OR
value

AUTHORIZED CONSUMPTION: 130,224.811 ML/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

34,264.168 ML/Yr

Apparent Losses

Unauthorized consumption: + ? 411.222 ML/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: + ? 6 1,265.429 ML/Yr
Systematic data handling errors: + ? 312.778 ML/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 1,989.429 ML/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 32,274.739 ML/Yr

WATER LOSSES: 34,264.168 ML/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 35,874.325 ML/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains: + ? 8 4,945.0 kilometers
Number of active AND inactive service connections: + ? 8 312,075
Service connection density: 63 conn./km main

Are customer meters typically located at the curbstop or property line? No (length of service line, beyond the property boundary, that is the responsibility of the utility)
Average length of customer service line: + ? 8 12.0 metres

Average operating pressure: + ? 8 50.8 metres (head)

COST DATA

Total annual cost of operating water system: + ? 9 \$169,973,759 \$/Year
Customer retail unit cost (applied to Apparent Losses): + ? 9 \$2.35 \$/1000 litres
Variable production cost (applied to Real Losses): + ? 9 \$73.54 \$/Megalitre ☒ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 72 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources

2: Billed metered

3: Customer metering inaccuracies



Example Audit 2b:

AWWA Free Water Audit Software: System Attributes and Performance Indicators

WAS v5.0

American Water Works Association.
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Water Audit Report for: **The City of Calgary**

Reporting Year: **2013** **1/2013 - 12/2013**

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

Apparent Losses:	1,989.429	ML/Yr
+	Real Losses:	32,274.739 ML/Yr
=	Water Losses:	34,264.168 ML/Yr

? Unavoidable Annual Real Losses (UARL): **8,015.57** ML/Yr

Annual cost of Apparent Losses: **\$4,675,159**

Annual cost of Real Losses: **\$75,845,637** Valued at **Customer Retail Unit Cost**
Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial: { Non-revenue water as percent by volume of Water Supplied: **21.8%**
Non-revenue water as percent by cost of operating system: **49.6%** Real Losses valued at Customer Retail Unit Cost

Operational Efficiency: { Apparent Losses per service connection per day: **17.47** litres/connection/day
Real Losses per service connection per day: **283.34** litres/connection/day
Real Losses per length of main per day*: **N/A**
Real Losses per service connection per day per meter (head) pressure: **5.58** litres/connection/day/m

From Above, Real Losses = Current Annual Real Losses (CARL): **32,274.74** ML/year

? Infrastructure Leakage Index (ILI) [CARL/UARL]: **4.03**

* This performance indicator applies for systems with a low service connection density of less than 20 service connections/kilometre of pipeline



AWWA Water Audit Software Version 5.0 Developed by the Water Loss Control Committee of the American Water Works Association August, 2014

This software is intended to serve as a basic tool to compile a preliminary, or “top-down”, water audit. It is recommended that users also refer to the current edition of the AWWA M36 Publication, Water Audits and Loss Control Programs, for detailed guidance on compiling a comprehensive, or “bottom-up”, water audit using the same water audit methodology.

DEVELOPED BY: Andrew Chastain-Howley, PG*, MCSM. Black & Veatch
Will J. Jernigan, P.E. Cavanaugh & Associates, P.A.
George Kunkel, P.E. Philadelphia Water Department
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Ralph Y. McCord, P.E. Louisville Water Company
David A. Sayers Delaware River Basin Commission
Brian M. Skeens, P.E. CH2M HILL
Reinhard Sturm Water Systems Optimization, Inc.
John H. Van Arsdel M.E. Simpson Company, Inc.

REFERENCES: - Alegre, H., Hirner, W., Baptista, J. and Parena, R. Performance Indicators for Water Supply Services. IWA Publishing 'Manual of Best Practice' Series, 2000. ISBN 1 900222 272
- Kunkel, G. et al, 2003. Water Loss Control Committee Report: Applying Worldwide Best Management Practices in Water Loss Control. Journal AWWA, 95:8:65
- AWWA Water Audits and Loss Control Programs, M36 Publication, 3rd Edition, 2009
- Service Connection Diagrams courtesy of Ronnie McKenzie, WRP Pty Ltd.

VERSION HISTORY:

Version:	Release Date:	Number of Worksheets:	Key Features and Developments
v1	2005/ 2006	5	The AWWA Water Audit Software was piloted in 2005 (v1.0 beta). The early versions (1.x) of the software restricted data entry to units of Million Gallons per year. For each entry into the audit, users identified whether the input was measured or estimated.
v2	2006	5	The most significant enhancement in v2 of the software was to allow the user to choose the volumetric units to be used in the audit, Million Gallons or Thousand Cubic Metres (megalitres) per year. Two financial performance indicators were added to provide feedback to the user on the cost of Real and Apparent losses.
v3	2007	7	In v3, the option to report volumetric units in acre-feet was added. Another new feature in v3 was the inclusion of default values for two water audit components (unbilled unmetered and unauthorized consumption). v3 also included two examples of completed audits in units of million gallons and Megalitres. Several checks were added into v3 to provide instant feedback to the user on common data entry problems, in order to help the user complete an accurate water audit.
v4 - v4.2	2010	10	v4 (and versions 4.x) of the software included a new approach to data grading. The simple "estimated" or "measured" approach was replaced with a more granular scale (typically 1-10) that reflected descriptions of utility practices and served to describe the confidence and accuracy of the input data. Each input value had a corresponding scale fully described in the Grading Matrix tab. The Grading Matrix also showed the actions required to move to a higher grading score. Grading descriptions were available on the Reporting Worksheet via a pop-up box next to each water audit input. A water audit data validity score is generated (max = 100) and priority areas for attention (to improve audit accuracy) are identified, once a user completes the required data grading. A service connection diagram was also added to help users understand the impact of customer service line configurations on water losses and how this information should be entered into the water audit software. An acknowledgements section was also added. Minor bug fixes resulted in the release of versions 4.1 and 4.2. A French language version was also made available for v4.2.
v5	2014	12	In v5, changes were made to the way Water Supplied information is entered into software, with each major component having a corresponding Master Meter Error Adjustment entry (and data grading requirement). This required changes to the data validity score calculation; v5 of the software uses a weighting system that is, in part, proportional to the volume of input components. The Grading Matrix was updated to reflect the new audit inputs and also to include clarifications and additions to the scale descriptions. The appearance of the software was updated in v5 to make the software more user-friendly and several new features were added to provide more feedback to the user. Notably, a dashboard tab has been added to provide more visual feedback on the water audit results and associated costs of Non-Revenue Water. A comments sheet was added to allow the user to track notes, comments and to cite sources used.

Appendix D

Water Shortage Contingency Plan

BEFORE THE BOARD OF DIRECTORS
OF THE
KERN COUNTY WATER AGENCY

In the matter of:

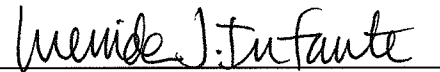
ESTABLISHING AN IMPROVEMENT *
DISTRICT NO. 4 WATER SHORTAGE *
CONTINGENCY PLAN *

I, Lucinda J. Infante, Secretary of the Board of Directors of the Kern County Water Agency, of the County of Kern, State of California, do hereby certify that the following resolution proposed by Director Mathews, and seconded by Director Van Skike, was duly passed and adopted by said Board of Directors at an official meeting hereof this 27th day of April, 2011 by the following vote, to wit:

Ayes: Lundquist, Van Skike, Mathews, Rogers, Page, Parker and Radon

Noes: None

Absent: None


Secretary of the Board of Directors
of the Kern County Water Agency

Resolution No. 27-11

WHEREAS, the Board of Directors of the Kern County Water Agency (Agency) is also empowered as the Board of Directors of the Kern County Water Agency Improvement District No. 4 (ID4); and

WHEREAS, the Urban Water Management Planning Act (Act) (Water Code 10610, et seq.) requires urban water suppliers to update prescribed urban water management plans before July 1, 2011; and

WHEREAS, the Act requires urban water suppliers to develop a water shortage contingency plan in the event of a water supply shortage of 50 percent; and

WHEREAS, the Agency has executed Agreements for a Water Supply with California Water Service, City of Bakersfield, East Niles Community Services District and North of the River Municipal Water District (Purveyor Agreements); and

WHEREAS, Article 12 of the Purveyor Agreements describe the actions the Agency will take in the event of a water shortage; and

WHEREAS, the Agency may diminish a shortage in treated water by temporarily halting or curtailing its spreading of water for recharge in ID4; and

WHEREAS, the Agency may use ID4 groundwater banking projects or in-district wells for reducing shortages subject to separate agreements from the Purveyor Agreements; and

WHEREAS, to eliminate or reduce shortages, the Agency will allow a Purveyor to deliver non-ID4 surface water to the Henry C. Garnett Water Purification Plant for treatment, subject to the provisions in the Purveyor Agreements; and

WHEREAS, the Agency shall apportion available treated water among the Purveyors in proportion to their annual entitlements as set forth in Exhibit D of the Purveyor Agreements in any year the shortage causes the total quantity of water available to the Agency to be less than the total of all quantities contracted; and

NOW, THEREFORE, BE IT RESOLVED, by the Board of Directors of the Kern County Water Agency that:

1. The foregoing recitals are true and correct.
2. Agency staff is directed to implement the measures described in Article 12 of the Purveyor Agreements in the event of a water shortage.

Appendix E
2013-14 CUWCC BMP Reports



CUWCC BMP Wholesale Coverage Report 2013

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

141 Kern County Water Agency

Name: Donna Semar

Email: dsemar@kcwa.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 2.1 Public Outreach	0	10117	
BMP 2.2 School Education Program	0	50072	

b) Technical Support

c) Retail Agency

Retail Agency Name	Program Description
California Water Service Company - Bakersfield	Public Outreach/School Education
North of the River MWD - Retail	Public Outreach/School Education
Other	Public Outreach/School Education
Other	Public Outreach/School Education

d) Water Shortage Allocation

Adoption Date: 4/27/2011

File Name:

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recruit Retailers

CUWCC membership is reviewed annually as part of the Agency's budget adoption process. Membership benefits are discussed with ID4 customers and non-CUWCC members are encouraged to join.

ID4 FY2012-13 Associations.pdf

At Least As effective As

No

Exemption

No

Comments:



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control

ON TRACK

141 Kern County Water Agency

Completed Standard Water Audit Using AWWA Software? Yes

AWWA File provided to CUWCC? Yes

AWWA Water Audit Validity Score? 73

Complete Training in AWWA Audit Method Yes

Complete Training in Component Analysis Process? Yes

Component Analysis? Yes

Repaired all leaks and breaks to the extent cost effective? Yes

Locate and Repair unreported leaks to the extent cost effective? Yes

Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair. Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	0	0	13.5	True	0	0

At Least As effective As

No

Exemption

No

Comments:



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

141 Kern County Water Agency

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes
At Least As effective As	<input type="text" value="No"/>
Exemption	<input type="text" value="No"/>
Comments:	



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

141 Kern County Water Agency

Wholesale

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

California Water Service Company - Bakersfield, North of the River MWD - Retail	
City of Bakersfield, Art Chianello, achianel@bakersfieldcity.us	
East Niles Community Services District, Tim Ruiz, trui@eastnilescsd.org	
Agency Name	ID number
California Water Service Company - Bakersfield	5001
North of the River MWD - Retail	6275

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quarter of the reporting year? No

Public Outreach Program List	Number
General water conservation information	15
Total	15

Did at least one contact take place during each quarter of the reporting year? Yes

Number Media Contacts	Number
Television contacts	22
Radio contacts	14
Newspaper contacts	33
News releases	7
Total	76

Did at least one website update take place during each quarter of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Information	10200
Total Amount:	10200

Description of all other Public Outreach programs

Comments:



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

At Least As effective As

No

--

Exemption

No

0



CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

141 Kern County Water Agency

Wholesale

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

California Water Service Company - Bakersfield, North of the River MWD - Retail

City of Bakersfield, Art Chianello, achianel@bakersfieldcity.us
East Niles Community Services District, Tim Ruiz, truz@eastnilescsd.org

Agencies Name	ID number
California Water Service Company - Bakersfield	5001
North of the River MWD - Retail	6275

Materials meet state education framework requirements? Yes

Please see description below.

Materials distributed to K-6? Yes

The grade-level units are designed to teach students the importance of water and its conservation. All units address Kern County's water supplies, the Henry C. Garnett Water Purification Plant, groundwater banking programs and water conservation.

Materials distributed to 7-12 students? Yes (Info Only)

Groundwater education for secondary students is a comprehensive science unit that comes complete with lesson plans, classroom demonstrations, laboratory exercises, games, assessment activities, and a California groundwater map.

Annual budget for school education program: 52500.00

Description of all other water supplier education programs

Comments:

At Least As effective As

No

Exemption

No

0



CUWCC BMP Wholesale Coverage Report 2014

Foundational Best Management Practices for Urban Water Efficiency

BMP 1.1 Wholesale Agency Assistance Programs

ON TRACK

141 Kern County Water Agency

Name: Donna Semar

Email: dsemar@kcwa.com

a) Financial Investments and Building Partnerships

BMP Section	Monetary Amount for Financial Incentives	Monetary Amount for Equivalent Resources	
BMP 2.1 Public Outreach	0	12180	
BMP 2.2 School Education Program	0	50899	

b) Technical Support

c) Retail Agency

Retail Agency Name	Program Description
California Water Service Company - Bakersfield	Public Outreach/School Education
North of the River MWD - Retail	Public Outreach/School Education
Other	Public Outreach/School Education
Other	Public Outreach/School Education

d) Water Shortage Allocation

Adoption Date: 4/27/2011

File Name: The Agency Board adopted the ID4 Water Shortage Contingency Plan on April 27, 2011.

e) Non signatory Reporting of BMP implementation by non-signatory Agencies

f) Encourage CUWCC Membership List Efforts to Recruit Retailers

CUWCC membership is reviewed on an annual basis as the ID4 budget is considered for adoption. Benefits of CUWCC membership are discussed and non-CUWCC members are encouraged to join.

At Least As effective As

No

Exemption

No

Comments:



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control

ON TRACK

141 Kern County Water Agency

Completed Standard Water Audit Using AWWA Software? Yes

AWWA File provided to CUWCC? Yes

AWWA Water Audit Validity Score? 73

Complete Training in AWWA Audit Method Yes

Complete Training in Component Analysis Process? Yes

Component Analysis? Yes

Repaired all leaks and breaks to the extent cost effective? Yes

Locate and Repair unreported leaks to the extent cost effective? Yes

Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair. Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
0	0	0	13.5	True	0	0

At Least As effective As

No

Exemption

No

Comments:



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

141 Kern County Water Agency

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	No
Feasibility Study provided to CUWCC?	No
Date:	
Uploaded file name:	
Completed a written plan, policy or program to test, repair and replace meters	Yes
At Least As effective As	<input type="text" value="No"/>
Exemption	<input type="text" value="No"/>
Comments:	



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

141 Kern County Water Agency

Wholesale

Does your agency perform Public Outreach programs? Yes

The list of retail agencies your agency assists with public outreach

California Water Service Company - Bakersfield, North of the River MWD - Retail

City of Bakersfield, Art Chianello, achianel@bakersfieldcity.us

East Niles Community Services District, Tim Ruiz,
truiz@eastnilescsd.org

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quarter of the reporting year? Yes

Public Outreach Program List	Number
General water conservation information	38
Total	38

Did at least one contact take place during each quarter of the reporting year? Yes

Number Media Contacts	Number
Television contacts	79
Radio contacts	28
Newspaper contacts	56
News releases	8
Total	171

Did at least one website update take place during each quarter of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Information	10200
Total Amount:	10200

Public Outreach Additional Programs

Water - Every Drop Counts in Kern Bus Wrap Campaign

Description of all other Public Outreach programs

Comments:

At Least As effective As

No



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

--

Exemption

No

0



CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

141 Kern County Water Agency

Wholesale

Does your agency implement School Education programs? Yes

The list of retail agencies your agency assists with public outreach

California Water Service Company - Bakersfield, North of the River MWD - Retail

City of Bakersfield, Art Chianello, achianel@bakersfieldcity.us
East Niles Community Services District, Tim Ruiz, truz@eastnilescsd.org

Agencies Name	ID number
California Water Service Company - Bakersfield	5001
North of the River MWD - Retail	6275

Materials meet state education framework requirements? Yes

Materials are aligned to Common Core and Next Generation Science Standards.

Materials distributed to K-6? Yes

The grade-level units are designed to teach students the importance of water and its conservation. All units address Kern County's water supplies, the Henry C. Garnett Water Purification Plant, groundwater banking programs and water conservation.

Materials distributed to 7-12 students? Yes (Info Only)

Groundwater education for secondary students is a comprehensive science unit that comes complete with lesson plans, classroom demonstrations, laboratory exercises, games, assessment activities, and a California groundwater map.

Annual budget for school education program: 52500.00

Description of all other water supplier education programs

Comments:

At Least As effective As

No

Exemption

No

0

Appendix F

Standardized UWMP Tables

Table 2-2: Plan Identification			
Select Only One	Type of Plan		Name of RUWMP or Regional Alliance <i>if applicable</i> <i>drop down list</i>
<input checked="" type="checkbox"/>	Individual UWMP		
	<input type="checkbox"/>	Water Supplier is also a member of a RUWMP	
	<input type="checkbox"/>	Water Supplier is also a member of a Regional Alliance	
<input type="checkbox"/>	Regional Urban Water Management Plan (RUWMP)		
NOTES:			

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
<input checked="" type="checkbox"/>	Agency is a wholesaler
<input type="checkbox"/>	Agency is a retailer
Fiscal or Calendar Year (select one)	
<input checked="" type="checkbox"/>	UWMP Tables Are in Calendar Years
<input type="checkbox"/>	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Date that the Fiscal Year Begins (mm/dd)	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

Table 2-4 Wholesale: Water Supplier Information Exchange (select one)

<input type="checkbox"/>	Supplier has informed more than 10 other water suppliers of water supplies available in accordance with CWC 10631. Completion of the table below is optional. If not completed include a list of the water suppliers that were informed.
	Provide page number for location of the list.
<input checked="" type="checkbox"/>	Supplier has informed 10 or fewer other water suppliers of water supplies available in accordance with CWC 10631. Complete the table below.

Water Supplier Name <i>(Add additional rows as needed)</i>	
California Water Service Company	
Casa Loma Water Company	
East Niles Community Services District	
North of the River MWD	
Oildale Mutual Water Company	
Vaughn Water Company	
City of Bakersfield	
NOTES:	

Table 3-1 Wholesale: Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040(opt)
	386,612	402,551	413,995	425,438	436,882	444,461

NOTES: These values were obtained using data from Kern COG. The annual growth rate observed through the years 2015-2025 was found to be approximately .66%, and the annual growth rate for the years 2015-2040 was found to be approximately .69%.

Table 4-1 Wholesale: Demands for Potable and Raw Water - Actual

Use Type (Add additional rows as needed)	2015 Actual		
Drop down list <i>May select each use multiple times</i> <i>These are the only use types that will be recognized by the WUE data online submittal tool</i>	Additional Description (as needed)	Level of Treatment When Delivered <i>Drop down list</i>	Volume
Sales to other agencies		Drinking Water	29,032
Groundwater recharge	In-District Transport	Raw Water	14,491
Losses	Out of District	Raw Water	1,972
TOTAL			45,495
NOTES: 7,194 af of available SWP supply carried over to 2016 			

Table 4-2 Wholesale: Demands for Potable and Raw Water - Projected

Use Type <i>(Add additional rows as needed)</i>	Additional Description <i>(as needed)</i>	Projected Water Use <i>Report To the Extent that Records are Available</i>				
<i>Drop down list</i> <i>May select each use multiple times</i> <i>These are the only Use Types that will be recognized by the WUEdata online submittal tool.</i>		2020	2025	2030	2035	2040 (opt)
Sales to other agencies	Contracted Sales	49,500	50,500	51,750	53,000	53,000
Groundwater recharge	In-District Transport	9,890	10,075	10,325	10,600	10,600
Losses	Out of District	2,000	2,000	2,000	2,000	2,000
TOTAL		61,390	62,575	64,075	65,600	65,600
Notes:						

Table 4-3 Wholesale: Total Water Demands

	2015	2020	2025	2030	2035	2040(opt)
Potable and Raw Water <i>From Tables 4-1 and 4-2</i>	45,495	61,390	62,575	64,075	65,600	65,600
Recycled Water Demand* <i>From Table 6-4</i>	0	0	0	0	0	0
TOTAL WATER DEMAND	45,495	61,390	62,575	64,075	65,600	65,600

**Recycled water demand fields will be blank until Table 6-4 is complete.*

NOTES: ID4 does not treat or distribute recycled water.

Table 4-4 Wholesale: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss*
01/2015	1,386
* Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.	
NOTES:	

Table 6-1 Wholesale: Groundwater Volume Pumped

<input type="checkbox"/>	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type <i>Drop Down List</i> <i>May use each category multiple times</i>	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	San Joaquin Valley 5-22.14	0	1,319	30,167	66,081	52,738
TOTAL		0	1,319	30,167	66,081	52,738
NOTES: There are no fractured rock wells within ID4.						

Table 6-3 Wholesale: Wastewater Treatment and Discharge Within Service Area in 2015

<input checked="" type="checkbox"/>	Wholesale supplier neither distributes nor provides supplemental treatment to recycled water. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number (optional)	Method of Disposal <i>Drop down list</i>	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level <i>Drop down list</i>	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
Total							0	0	0	0
NOTES:										

Table 6-4 Wholesale: Current and Projected Retailers Provided Recycled Water Within Service Area

<input checked="checked" type="checkbox"/>	Recycled water is not directly treated or distributed by the supplier. The supplier will not complete the table below.						
Name of Receiving Supplier or Direct Use by Wholesaler	Level of Treatment <i>Drop down list</i>	2015	2020	2025	2030	2035	2040 <i>(opt)</i>
<i>Add additional rows as needed</i>							
Total		0	0	0	0	0	0
NOTES:							

Table 6-5 Wholesale: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual

<input type="checkbox"/>	Recycled water was not used or distributed by the supplier in 2010, nor projected for use or distribution in 2015. The wholesale supplier will not complete the table below.	
Name of Receiving Supplier or Direct Use by Wholesaler	2010 Projection for 2015	2015 actual use
<i>Add additional rows as needed</i>		
Total	0	0
NOTES:		

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
<input type="checkbox"/>	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
<input type="checkbox"/>	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type Drop Down list	Expected Increase in Water Supply to Agency
	Drop Down Menu	If Yes, Agency Name				
Add additional rows as needed						
CVC Extension Lining - Pool No. 7	No			2017	All Year Types	1,000
NOTES:						

Table 6-8 Wholesale: Water Supplies — Actual

Water Supply	Additional Detail on Water Supply	2015		
Drop down list <i>May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool</i>		Actual Volume	Water Quality <i>Drop Down List</i>	
Add additional rows as needed				
Purchased or Imported Water	SWP Supply	17,103	Raw Water	
Supply from Storage	Banked Water Recovery	41,813	Raw Water	
Total		58,916		
NOTES:				

Table 6-9 Wholesale: Water Supplies — Projected

Water Supply	Additional Detail on Water Supply	Projected Water Supply <i>Report To the Extent Practicable</i>									
		2020		2025		2030		2035		2040 (opt)	
<i>Drop down list</i> <i>May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool</i>		Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)
<i>Add additional rows as needed</i>											
Purchased or Imported Water	SWP Supply	49,768		49,768		49,768		49,768		49,768	
Supply from Storage	Banked Water Recovery	86,066		86,066		86,066		86,066		86,066	
	Total	135,834	0	135,834	0	135,834	0	135,834	0	135,834	0

NOTES: SWP Supply is projected normal year supply, 60% of Table A amount. Banked Water Recovery is maximum available under the water bank contract.

Table 7-1 Wholesale: Basis of Water Year Data

Year Type	Base Year <i>If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000</i>	Available Supplies if Year Type Repeats	
		<input type="checkbox"/>	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____
		<input checked="" type="checkbox"/>	Quantification of available supplies is provided in this table as either volume only, percent only, or both.
		Volume Available	% of Average Supply
Average Year		135,834	100%
Single-Dry Year	2014	90,213	66%
Multiple-Dry Years 1st Year	1931	113,438	84%
Multiple-Dry Years 2nd Year	1932	92,872	68%
Multiple-Dry Years 3rd Year	1933	84,173	62%
Multiple-Dry Years 4th Year <i>Optional</i>	1934	79,012	58%
Multiple-Dry Years 5th Year <i>Optional</i>			
Multiple-Dry Years 6th Year <i>Optional</i>			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

NOTES:

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals (autofill from Table 6-9)	135,834	135,834	135,834	135,834	135,834
Demand totals (autofill from Table 4-3)	61,390	62,575	64,075	65,600	65,600
Difference	74,444	73,259	71,759	70,234	70,234
NOTES:					

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison

	2020	2025	2030	2035	2040
Supply totals	90,213	90,213	90,213	90,213	90,213
Demand totals	61,390	62,575	64,075	65,600	65,600
Difference	28,823	27,638	26,138	24,613	24,613

NOTES:

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison

		2020	2025	2030	2035	2040
First year	Supply totals	113,438	113,438	113,438	113,438	113,438
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	52,048	50,863	49,363	47,838	47,838
Second year	Supply totals	92,782	92,782	92,782	92,782	92,782
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	31,392	30,207	28,707	27,182	27,182
Third year	Supply totals	84,176	84,176	84,176	84,176	84,176
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	22,786	21,601	20,101	18,576	18,576
Fourth year <i>(optional)</i>	Supply totals	79,012	79,012	79,012	79,012	79,012
	Demand totals	61,390	62,575	64,075	65,600	65,600
	Difference	17,622	16,437	14,937	13,412	13,412

NOTES:

Table 8-1 Wholesale Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Supply Reduction ¹	Water Supply Condition (Narrative description)
Add additional rows as needed		
1	10%	Combination of limited SWP Supply and constraint in Banked Water recovery
2	25%	Combination of limited SWP Supply and constraint in Banked Water recovery
3	50%	Catastrophic Interruption
¹ One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		
NOTES:		

Table 8-4 Wholesale: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	102,655	81,999	73,393
NOTES: Supplies are the sum of SWP Table A allocations in the driest three-year period of record (2013-2015) plus reasonably-available banked supply recovery.			

Table 10-1 Wholesale: Notification to Cities and Counties (select one)

<input type="checkbox"/>	Supplier has notified more than 10 cities or counties in accordance with CWC 10621 (b) and 10642. Completion of the table below is not required. Provide a separate list of the cities and counties that were notified.	
	Provide the page or location of this list in the UWMP.	
<input checked="" type="checkbox"/>	Supplier has notified 10 or fewer cities or counties. Complete the table below.	
City Name	60 Day Notice	Notice of Public Hearing
<i>Add additional rows as needed</i>		
Bakersfield	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
County Name <i>Drop Down List</i>	60 Day Notice	Notice of Public Hearing
<i>Add additional rows as needed</i>		
Kern County	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
NOTES:		

Appendix G

Completed UWMP Checklist

This checklist is developed directly from the Urban Water Management Planning Act and SB X7-7. It is provided to support water suppliers during preparation of their UWMPs. Two versions of the UWMP Checklist are provided – the first one is organized according to the California Water Code and the second checklist according to subject matter. The two checklists contain duplicate information and the water supplier should use whichever checklist is more convenient. In the event that information or recommendations in these tables are inconsistent with, conflict with, or omit the requirements of the Act or applicable laws, the Act or other laws shall prevail.

Each water supplier submitting an UWMP can also provide DWR with the UWMP location of the required element by completing the last column of either checklist. This will support DWR in its review of these UWMPs. The completed form can be included with the UWMP.

If an item does not pertain to a water supplier, then state the UWMP requirement and note that it does not apply to the agency. For example, if a water supplier does not use groundwater as a water supply source, then there should be a statement in the UWMP that groundwater is not a water supply source.

Appendix G

Completed UWMP Checklist

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	Page 4
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	NA
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	Page 6, Page 74
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	Page 8
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	Page 10
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	Page 13
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	Page 13
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	Page 13
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	Page 18
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	Page 21
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	NA
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	NA
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	NA

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	NA
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	NA
10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	NA
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	Page 22
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	Page 22
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	Page 24
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	Page 29
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	Page 36
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	Page 30
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	NA
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	Page 30 Page 31
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	Table 6-2, Page 31

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	Table 6-14, Page 45
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	Page 42
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	Page 43
10631(h)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	Page 41
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	NA
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	Table 2-3, Page 7
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	Page 39
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	Page 39
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	Table 6-8, Page 40
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	Page 40
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	Page 40

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	Table 6-9, Page 41
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	NA
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	NA
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	Page 56
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	Page 50
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	Table 7-1, Page 52
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	Section 7.5, Page 57
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.3	Page 53
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	Table 7-5, Page 57
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	Page 62, Appendix D
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	Table 8-3, Page 71
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	Page 65

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	Page 62
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	Section 8.4, Page 63
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	NA
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	Section 8.6, Page 64
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	Appendix D
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	Section 8.5, Page 63
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	NA
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	Section 9.1, Page 72
10631(i)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	Appendix E
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	Page 74, Appendix B
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	Table 10-1, Page 75

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	Page 77
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	Sec 10.2.5, Page 77
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	Sec 10.2, Page 76
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	Table 10-1, Appendix B
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	Appendix A
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	Sec 10.2.4, Page 77
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	Sec 10.2.4, Page 77
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	Sec 10.2.3, Page 77
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	Sec 10.3, Page 77